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CONTENTS

PRESIDENT BENTLEY called attention to a subject of great importance when he mentioned the need for the enactment and enforcement of legislation to prevent trespassing on railways and the accidents that result from it. As the RAILWAY AGE GAZETTE repeatedly has pointed out the number of fatalities resulting from this cause, for which railways are not responsible at all, is greater than the number resulting from all other causes combined. On the average the number of fatalities due to trespassing is over 5,000 a year. Unfortunately, the figures relating to them are included in the regular statistics of accidents, thereby giving the general public a wholly false impression regarding the hazards of railway employment and travel. The American Railway Association at its last meeting adopted a resolution calling attention to the injustice thus done the roads, and urging both federal and state action which will reduce trespassing, and which, so long as it continues, will cause the statistics on the subject to be presented in their proper light. It is a good thing to have attention directed to the subject here, also, and everywhere else where reference to it may tend to develop sentiment and influence developments that will tend to better the situation.

WITH modern locomotives, the railways that have excellent general repair facilities and poor terminal repair equipment are very seriously handicapped. While it is advisable, from every standpoint, to keep locomotives in the shop as short a time as possible and to turn out a perfectly operating machine, it is of far greater importance to keep them out of the shop and in condition to handle full tonnage for longer periods. The roads having good engine houses and terminal shops is the one that will show a low maintenance cost on a ton-mile basis.

THE report on safety valves was not long, but it brought out a good deal of discussion, more than any other report at yesterday morning's session. The discussion showed that the calibration of safety valves is no easy matter. Indeed, it is doubtful if any stamping or marking that may be put on the valve—and this is what the discussion swung about, for the most part—can be more than an approximate indication of what occurs. It is so hard to measure the lift that one experimenter has declared it to be impossible; and as for discharge capacity, Napier's rule may be all very well in its way, but the rate of flow of steam through the annular opening varies so in the size and form of the opening, as well as the shape of the passages, that discharge calculations would be only another approximation. Of course, this is disregarding such other important items as pressure and moisture content in the steam. With all these things considered, the course pursued, of accepting the report and asking the manufacturers' to indicate the lift and estimated discharge for a guide in the use of the valve, was doubtless the wisest. As for the use of three safety valves, the discussion brought out another phase of that ever recurrent question of what will the courts say. It being generally accepted that two safety valves are quite enough to care for any generation of steam in either coal or oil burning locomotives, the third valve is put on and advocated merely because of the extra insurance and a demonstration that everything has been done to avoid diseaster. In other words, it seems to be a recognition of and compliance with unreasonable demands.

THE suggestion made by President Bentley in his address, to the effect that the Master Mechanics' Association should co-operate with the minor railway mechanical associations, is a good one. The International Railway General Foremen's Association, for instance, is in a position to study thoroughly problems pertaining to shop organization and practices and to make recommendations as to the best methods to be followed under different conditions. It could do the same thing with the special problems in connection with shop operation and equipment. The Master Mechanics' Association must concern itself with the more general problems and cannot find the time to go thoroughly into these special, but none the less important, ones. On the other hand, the minor associations are specially fitted to take them up and would undoubtedly be only too glad to co-operate with the larger organization in investigating them. The Air Brake, Master Boiler Makers', General Foremen's, Tool Foremen's, Master Blacksmiths', Traveling Engineers' and Master Painters' associations have all shown that they mean business and have been growing steadily in strength

and efficiency. The formal recognition of the worth of these associations by the M. M. and M. C. B. associations, in the way of asking them to make certain detail investigations and recommendations thereon, would still further encourage them and add to their effectiveness. Moreover, it would make the two larger organizations the clearing house for all mechanical department matters. In times past a great deal of energy has been wasted by the smaller organizations in the consideration of subjects which had already been thoroughly gone into by other organizations, or in which they were not vitally interested. There is not so much of this at present, but a closer understanding between the organizations would prevent useless duplication of work.

THERE is so much of importance and interest in President Bentley's address that it is difficult to select any particular feature as being the keynote. The general theme seemed to be that there are many features of design and operation, each equally important, all of which should be given close attention. He also drew attention to the various more prominent features that have marked the progress of the last year. Safety was given the attention it deserves in the address, as was also fuel economy. The Chicago & North Western was among the pioneers in the movement toward greater safety to employees, and the figures quoted were striking evidence of what can and should be accomplished in this direction. Not alone should attention be directed toward safety to employees, but the railways should be protected against trespassers and a federal law against trespassing on railway property was suggested as a necessary part of the work. The appointment of a committee to confer with the Chief Boiler Inspector at Washington, D. C., and straighten out the confusion resulting from the conflicting rulings of the various local boiler inspectors, was advocated. Laws on headlights passed by the various states are proving to be not only a handicap but a menace in some cases. Mr. Bentley recommended that the proper minimum requirements suitable for a double or four-track road be determined and placed on the statute books of the various states, having laws on the subject, in place of those now in force. Special requirements could then be made for the single track lines where more powerful lights can be safely used, if it seemed desirable. The multiple track lines should not be required, Mr. Bentley said, to use as powerful lights as the single track roads. Attention was drawn to the fact that locomotives of the 2-8-2 type are replacing those of the 2-8-0 type and doing more work with the same fuel consumption. Fuel economy was said to be of greater importance than ever, and the good work of the International Railway Fuel Association, of which Mr. Bentley himself was elected president at the recent meeting in Chicago, was mentioned in the address.

LOCOMOTIVE STOKERS.

EACH year the report of the committee on stokers has been more encouraging, and this year it can be termed most decidedly encouraging. It seems that at least two stokers of distinctly different types can be called successful almost without qualification. There are now, in service and being built, 115 stokers of the underfeed type and 150 of the overfeed type. These are on locomotives of several different classes used for some of the most difficult runs in the East. Throughout the whole discussion there seemed to be no question in the mind of anyone present in regard to the ability of these two stokers to do the work for which they have been designed. The very number being used is convincing evidence that those in the position to know best have decided that they are reliable.

For the first time, actual fuel saving with stokers is even hinted at in the discussions on the reports of this committee. In several cases a distinct saving was reported as following successful stoker applications. Mr. Street related one instance where a locomotive was using coal that required 18 revolutions per minute of the conveyor. Full steam pressure was being maintained and the work was successful with the exception that there was more smoke than seemed desirable. The amount of coal being used was about the same as had been required with hand firing. It was thought that if the conveyor was operated at a slower speed and less coal was consumed it might reduce the smoke. This was tried and by a series of tests it was finally found that at 12 revolutions per minute, or 50 per cent. less than at the beginning, the steam pressure was maintained equally well and the smoke was practically eliminated. No tests have been reported bearing directly on this feature, but there is quite evidently an idea among those who have had the most experience with stokers that less coal is going to be required for the same work after the engine crews become more thoroughly acquainted with the stoker. At the beginning the fireman seems to be very doubtful of the actions of the steam gage unless he sees about the usual amount of coal going into the firebox. The tendency at the start is always to overload the fire with coal.

What is the limit of the capacity of the average fireman in pounds of coal per hour on trips covering eight to ten hours? C. D. Young states between 4,000 and 5,000. Mr. Crawford recommended about 3,500, and the statements of other members seem to indicate a general idea that it should not be over 4,000. This conveyed the impression that all locomotives in regular road service that burn over this amount should be equipped with stokers. Later Mr. Crawford made clear that this was not exactly his idea. The automatic stoker is a necessity for very large locomotives, and in the coming year its various advantages will be developed by its use in such service and by application to smaller power. At present there is a prevailing idea that the dividing line where it is an advantage is where the average endurance of the fireman is reached. This view regards the stoker simply as a means of increasing the capacity of the engine. It does not take account of the incidental advantages such as economy of fuel, prevention of smoke and uniformly sustained maximum boiler pressure. These apply to locomotives of ordinary dimensions and indicate that there will be no fixed rule which limits the application of the stoker to a certain rate of coal consumption.

The record of amount of coal handled by one man was reported by Mr. Young as 8,400 lbs. an hour on a three hour trip. The train in this case averaged over sixty miles per hour. On the testing plant a fireman has fired 9,700 lbs. of coal per hour.

A point of far-reaching importance was advanced by Mr. Baker and received the attention of several other speakers. This is the fact that the quality of the engineers in the near future depends very largely on the quality of the firemen now being employed. If the work of firing prohibits a man of ordinary strength and intelligence undertaking it, it will have a serious result on the standing and class of the future engineers. If the stokers will encourage intelligent men to enter the ranks of firemen that alone will justify its general adoption.

In reference to the size of locomotives to which stokers should be applied, Mr. Crawford explained his plan to apply stokers to the larger engines first and then put stokers in the lighter power, principally that used around terminals and in suburban service. This is for the purpose of reducing smoke in the urban districts, as these locomotives are not in the least difficult to hand fire.

LOCOMOTIVE MAIN AND SIDE RODS.

IN considering the report on main and side rods, which is to be presented to-day, special attention should be given to the quality of the steel for use in locomotive details of this sort. While the experience with special alloy and heat treated steels in locomotive details is limited, it is unfortunate that this is true, for their great advantage in other similar engineering details is well recognized and their use well established. Carbon steel axles, annealed and toughened by heat treatment, have been used extensively, and alloy steel, heat-treated and oil-tempered, is used for shafts and marine machinery, and fills an important place in much of the high speed electrical machinery. In such important details as the rods for high speed locomotives the steel is forged and cooled in a rough way with little or no attention to the effect of this treatment on its granular structure, its toughness and elastic limit.

The use of alloy steel for such purposes is so limited that it was the subject of special mention when employed for the frames, cylinders and machinery of a special test locomotive, No. 50,000, recently built. Rod design has not yet been developed to the extent that it is possible by the use of high strength steel, high working stress and the smaller sections which naturally follow. The further development of the subject with respect to these possibilities should be completed before the work on the design of locomotive rods can be regarded as finishd.

In the discussion of the report last year it was shown that the breakage of fluted rods was so general that a number of lines had given up the I-section and were now using a rectangular section which caused a considerable increase in the weight of the rods. On other lines the rods are made of iron and fluted. One reason assigned to the breakage of steel fluted rods was the fact that in the forging process with a steam hammer the surface of the billet is compressed and the grain is closed up while the interior portion receives little effect of the work, and its structure has a coarse open grain with low strength and ductility. Such a forging is then milled so as to remove the best part of the steel and the poorest part remains in the web of the I-section. To overcome this, forging under hydraulic press and the use of dies which would form the rough fluted portion was recommended. The representative of a locomotive works stated that it was difficult to get uniform material for steel rods, and his description of the pipes, seams and similar defects due to segregation would indicate that the ingots bought for this purpose were of much the same character as those from which rails are manufactured.

A reading of this discussion will convince anyone that the quality of the steel used for locomotive rods and the methods of forging are not what they ought to be, and that properly proportioned rods which will not break under normal service will not be obtained until there is some considerable improvement in this respect. A high factor of safety is made necessary by the low strength and irregular quality of the steel used in current practice. The working stress now recommended is less than 13,000 lbs., or about one-sixth the ultimate strength of 80,000 lbs. For the rods of high speed engines it is easily possible to obtain steel having an ultimate strength of 110,000 lbs., and an elastic limit of 75,000 to 80,000 lbs., and with such material the section could be smaller and the rods lighter. This should be the direction of progress, but the return to the use of wrought iron and rectangular sections has been quite general according to the discussion as published in the last proceedings, indicating that the distrust of steel forgings as ordinarily made places the material below wrought iron in ultimate strength. This is a condition which should not continue, and the Master Mechanics' Association should not be content with formulæ and factors in rod design, but should insist on a proper specification for rod steel and a thorough description of the correct method of forging locomotive rods so that the proper unit strength is secured in the steel when finished. This would be a natural supplement to the present report on rod design, and the present committee should be continued to complete the work.

CAST STEEL LOCOMOTIVE FRAMES.

IT is unfortunate that the report on Specifications for Cast Steel Locomotive Frames has been delayed for another year, for the locomotive works are now busy turning out large locomotives and will probably continue to have a large output during the whole of the year to come. The design and proportion of the frames for these large engines should be based on the quality of the material, and there is now a pressing demand for a proper specification for cast steel suitable for this purpose.

The relation of locomotive power to the total weight has had some consideration in designing passenger engines in order to increase the size of boiler without exceeding the proper limits of wheel loads, and there is no good reason why the same principle should not be applied to large freight engines where the boiler is so heavy that some reduction in weight of other principal parts can be made without making the total less than that required for adhesion. To obtain the necessary weight on drivers by the use of heavy frames is a crude method of design, and yet it is frequently seen in many locomotives where this extra weight would be more advantageous in the boiler. Locomotive frames are now made 6 in. and 7 in. wide, and they require wide pedestal binders and other fittings which are correspondingly heavy, and these are located where the frequent removal necessary is laborious. It is surprising too to find these heavy frames of uniform width, when the pattern could be made of various widths proportional to the loads. The drawings of cast steel locomotive frames show that the old plans which were used for wrought iron are still used, and if the proportions are changed they are enlarged, which indicates that the superior strength of the new material is not utilized.

This is probably due to the fact that for a time cast steel frames of the same dimensions as wrought iron broke with equal frequency, but these steel frames were not annealed and they failed on account of shrinkage stresses. Nevertheless, extreme caution still prevents most designers from taking advantage of the greater reliability of the annealed cast steel frames. The wrought iron frame with its numerous welds, or places where the grain of the iron was affected by the welding operation, lacked uniformity in strength, and this defect was about balanced in the cast steel frame by local stresses and poor granular structure due to lack of annealing. The majority of locomotive frames are now made of steel, and good practice requires them to be annealed. Added to this, the use of alloys in steel produces a metal of superior strength and high elastic limit. The ultimate strength of such material is over 80,000 lbs. and the elastic limit 50,000 lbs. With such material available it ought to be possible to revise the drawings, making the frames lighter, and by rational design of the sections they should be of more uniform strength.

A thorough investigation of the quality of steel for locomotive frames and proper heat treatment should result in such a modification of frame design that it would favorably affect other locomotive proportions. These advantages are in a way proportional to the weight of the locomotive, and with the enormous machines now coming into service so rapidly it will be seen that a specification for the grade of steel used in frames should be forthcoming without any delay.

Announcements.

TO-DAY'S PROGRAM.

M. M. ASSOCIATION.

Discussion of reports on:	
Main and Side Rods	9.30 to 10.00
Consolidation	10.00 to 10.15
Safety Valves	10.15 to 10.45
Safety Appliances	10.45 to 11.00
Design, Construction and Maintenance of Locomotive Boilers	11.00 to 12.00
Contour of Tires	12.00 to 12.30
Individual Paper on Increased Power obtained with Superheat as Compared with the Maximum Power obtained with Saturated Steam, Prof. C. H. Benjamin and Prof. L. E. Endsley	12.30 to 1.00
Steel Tires	1.00 to 1.30

ENTERTAINMENTS.

Orchestra Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Orchestra Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Informal Dance, 9.30 P. M.—Entrance Hall, Million Dollar Pier.

FOUND.

Two pairs of eyeglasses. Apply at office of John D. Conway, secretary of the Railway Supply Manufacturers' Association.

M. M. MEMBERS PLEASE REGISTER.

In the meeting yesterday Secretary Taylor asked the members of the M. M. Association to register some time during the three days of their convention. It is only by their registering a second time that the association will be able to find out who is in attendance at the M. M. convention, and if they will do so the secretary will appreciate it very much.

TRANSPORTATION FOR RETURN TRIPS.

The Pennsylvania has notified members of the M. M. Association that transportation home over the Pennsylvania lines will be provided if they will hand their names to Secretary Taylor. This transportation must be limited to bona fide railway officers and cannot include members of belt lines, car lines or switching roads operated by industrials.

The Central of New Jersey offers the same courtesy to members who wish to return over the Central of New Jersey or the Reading. A special train of parlor cars for New York will leave Atlantic City at 2.30 on Wednesday afternoon, June 19.

SPECIAL TRAIN TO COATESVILLE.

The Parkesburg Iron Company will run a special train of all stateroom cars via Pennsylvania Railroad, leaving Atlantic City at 9.03 P. M., Wednesday, June 19. After inspecting the Parkesburg skelp and tube mills, automobiles will be provided to take the passengers to see the Jacobs-Schupert low water boiler test at Coatesville, Pa.

The special will leave Parkesburg for Philadelphia at 4.30 P. M. Thursday.

All railway officers who have made preliminary arrangements and other railway men who wish to go will secure tickets Wednesday at the Parkesburg Iron Co.'s booth, No. 388, until the accommodations are exhausted.

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Individual Paper:—"Report of progress on the increased power obtained with superheat as compared with the maximum power obtained with saturated steam," Dean C. H. Benjamin, Prof. L. E. Endsley.

THE B. & O. CLUB.

At a meeting yesterday in the American Car & Foundry Company's booth an organization was formed which probably will be called the B. & O. Club. It is to be composed of members and guests regularly attending the conventions of the mechanical associations who are or formerly were in the employ of the Baltimore & Ohio. E. W. Grieves, who was called on to make a speech, explaining the purpose of the meeting, told a story about an engineer and a fireman who were employed on the B. & O. when camel back locomotives were prevalent on it and who met in Chicago. Each soon found out that the other was a railway employe. "What road are you working for?" asked the engineer. "The B. & O," replied the fireman. "What's your road?" "I'm on the B. & O., too—what do you do?" "I run an engine," answered the engineer. "Well, I'm firing an engine. What's your engine's number?" "No. 713." "Well, now, that's strange," said the fireman; "I've been firing that same engine for a year." Mr. Grieves said that the B. & O. men shouldn't go on as that engineer and fireman had, the one in his cab on top of the boiler, the other down on his foot board without ever getting an introduction.

Organization was effected by the election of Charles F. Giles, superintendent of machinery of the Louisville & Nashville, and formerly in the B. & O.'s mechanical department, as president, and Charles L. Sullivan, sales manager of the Cowles-McDowell Engineering Company, formerly in the B. & O.'s drawing room, as secretary.

A committee composed of S. M. Dolin, J. Snowden Bell and A. Gordon Jones, was appointed to choose a name for the organization and draft a constitution and by-laws, and to submit them to the members by correspondence. The club will act on them next year. Its meetings will be held annually on the second day of the week in which the Master Mechanics' convention occurs.

The following attended the meeting yesterday:

Charles F. Giles, now superintendent machinery, L. & N., formerly in the B. & O.'s mechanical department; S. M. Dolan, now with American Car & Foundry Company, formerly in mechanical department; George A. Nicol, now with Johns-Manville Co., formerly in drawing room, Mt. Clare; Frank T. Hyndman, now with S. F. Bowser & Company, formerly in mechanical and operating departments; John Tonge, now retired superintendent motive power, formerly in mechanical department; B. M. Carr, now with American Car & Foundry Company, formerly in mechanical department; R. F. Kilpatrick, now with Ewald Iron Company, formerly in mechanical department; A. G. Sandman, now chief draftsman, B. & O.; Thomas G. Smallwood, now with Chicago Pneumatic Tool Company, formerly foreman machinery department; S. W. Mullinix, now mechanical superintendent, Second district, Rock Island Lines, formerly in machinery department; John B. Kilpatrick, now mechanical superintendent, First district, Rock Island Lines, formerly in mechanical department; Walter D. Thomas, now president A B C Bearing Corporation, formerly chief clerk to master car builder; Harry Monkhouse, now with Rome Locomotive Works, formerly master mechanic; E. W. Grieves, now with Galena-Oil Company, formerly superintendent car department; J. G. Platt, now sales manager, Hunt Spiller Manufacturing Corporation, formerly in mechanical department; George Moriarity, now master mechanic, New York, New Haven & Hartford, formerly in mechanical department; Joseph Billingham, now with American Locomotive Company, formerly master mechanic; J. W. Brewer, now master mechanic, Mt. Clare shops; G. A. Schmoll, now superintendent motive power, Wheeling; J. Kirkpatrick, now master mechanic, Newark; J. M. Shay, now general car foreman, Cincinnati; W. M. Bosworth, now mechanical engineer, Kansas City Southern, formerly in mechanical department; C. M. Thompson, now with C. M. Thompson Manufacturing Company, formerly draftsman; A. Gordon Jones, now with General Railway Supplies, formerly superintendent, Harper's Ferry and Valley division; John S. Mace, Philadelphia, formerly in mechanical department; R. W. Salisbury, now motive power inspector, Cincinnati; J. Snowden Bell, now patent attorney, New York, formerly in mechanical department; Charles L. Sullivan, now with Cowles-MacDowell Engineering Company, formerly in drawing room, Mt. Clare; E. L. Weisgerber, now retired, formerly master mechanic, Mt. Clare; R. Onderdonk, now engineer of tests, B. & O.; J. W. Fogg, now master mechanic, Chicago Terminal, formerly in mechanical department; John F. Mercer, now retired, formerly in mechanical department; E. W. Dill, William H. Shipley, B. N. Hawkins, C. E. Walker, William Sinnott, C. E. Calahan, George W. Coyle, George Rule, O. Shellhorn.

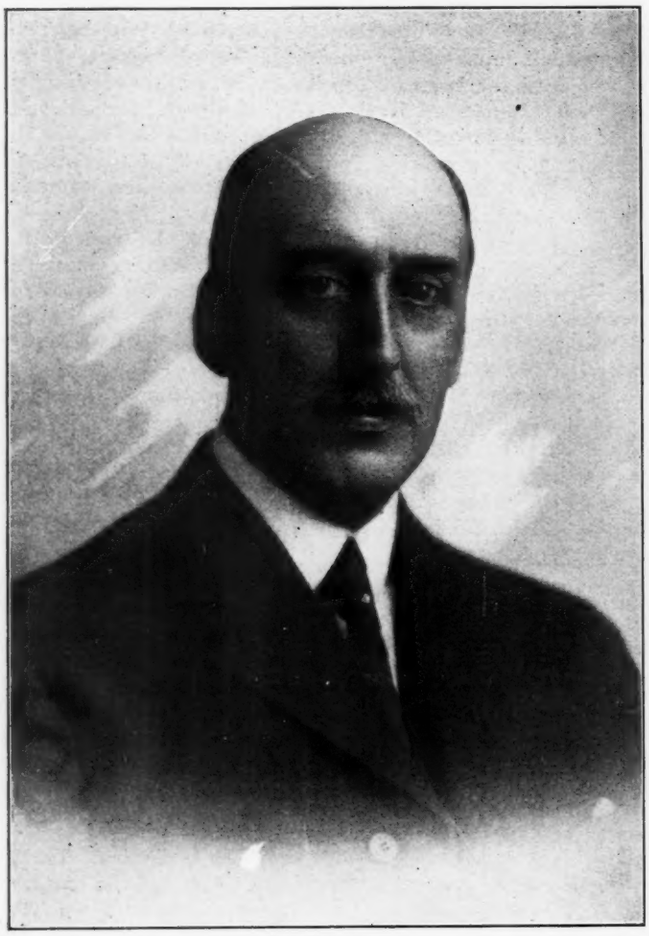
The Kalgan-Suiyuan line, China, is to be extended by the government within five years to Ilifu, the capital of China's most distant province on the Russian frontier, a distance of about 2,000 miles. This enterprise was first projected by Tang Shao Yi, and was seriously considered about the time of the completion of the Peking-Kalgan line. The enormous expense of the undertaking, however, caused the enterprise to be held in abeyance. Recent events have led to the present determination to build the line as soon as possible. The expense, of course, will be enormous, but there is strong probability of its commercial success from the beginning. There is heavy caravan traffic between North China and the country in question, which is known as the New Dominion, and the possibility of diverting much of the tea traffic with Russia to this route is promising. Possibilities of developing grain country also are immense. However, the line would probably not be justified at this time except as a governmental undertaking. Up to the present, it does not appear that this enterprise is to supersede the proposition to extend the Kalgan line to Kiahtka via Urga. The ultimate plan of the Kalgan-Suiyuan line is for it to connect with a north and south line bisecting Shansi province, though at latest report there was no definite work being done on this road. Chinese merchants are projecting a light railway from Harbin to Shuihue and Huilun, about 150 miles, for which 5,000,000 taels are being raised. The native press reports that of this sum 3,000,000 taels has been pledged by two native banks, and merchants are to furnish the balance. Aside from work commenced before present conditions developed there is little actual advancement promised in that portion of the country. Nevertheless it is there that railway enterprise is likely to have its best returns both to the investor and to the country.

Proceedings.

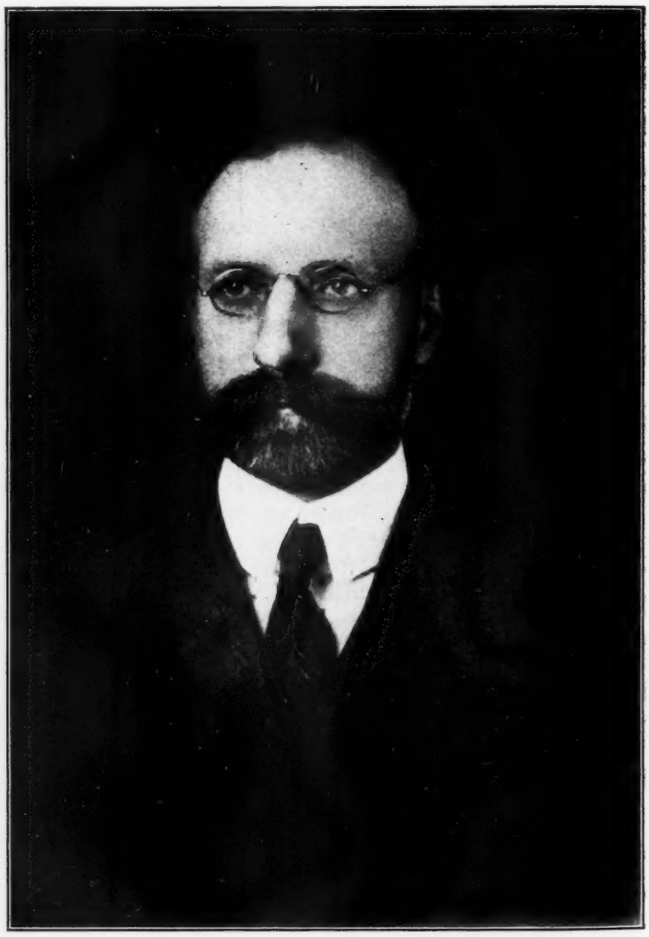
The first session of the forty-fifth annual meeting of the American Railway Master Mechanics' Association was held on June 17. Vice-President D. F. Crawford called the meeting to order at 9.45, in the absence of President H. T. Bentley who was absent from the meeting on account of illness. The past-presidents of both the Master Mechanics' and Master Car Builders' Association in attendance took seats on the platform. Rev. Dr. William Spurgeon, of London, England, opened the exercises with prayer. In the absence of Mayor Bacharach, of Atlantic City, the address of welcome was omitted and the president's address was read by the secretary.

ADDRESS OF PRESIDENT BENTLEY.

It is a pleasant duty and privilege to address you to-day, and welcome you at this opening of the forty-fifth convention of the American Railway Master Mechanics' Association, and the seventh consecutive one to be held in this beautiful city.



H. T. BENTLEY,
President, M. M. Association.



T. RUMNEY,
Second Vice-President, M. M. Association.

I feel grateful for the honor you have conferred on me, and hope it will be my good fortune at this time, and in the future, to uphold the dignity and prestige of the association, and to follow in the footsteps of my distinguished predecessors in office.

We are glad to see so many ladies here this morning, for their presence shows they are interested in the work that is being done by those near and dear to them, and a convention without ladies would be a very uninteresting affair, or as one man put it, like lemonade without sugar.

I wish to express my heartfelt thanks to the officers and members of the association who have done so much toward making the convention a memorable one; to the officers and secretary who have so cordially helped me, and to the members who have prepared papers on the various subjects, which I hope will be fully discussed to bring out the best there is in them; to the reverend gentleman who so ably opened the convention with such an uplifting prayer; to the exhibitors who have brought here, for our benefit one of the most comprehensive collections of tools, supplies, machines and apparatus that has ever been gathered together; to the members of the Supply Mens' Association who have cooperated with us in providing the entertainments and amusements; to the Hotel Mens' Association for the splendid manner in which they have taken care of us and made us feel so much at home; and to the members of the press who have helped us individually and collectively; the press we are indebted to for keeping us in touch with what is going on all over the world, and without its help we might perhaps be making the same mistakes that other people have made and paid for by dear experience.

In looking over the splendid exhibits brought here for our inspection, I wish to draw your attention to the increase in floor space taken, this year 82,148 square feet being allotted, which is an increase of 6,038 more than last year. As you will notice, greater taste has been displayed in arranging the booths, and I believe nothing has been left undone to make it the most successful display that we have ever looked upon.

At our last convention, I had the pleasure of responding to an address of welcome from your late Mayor, F. P. Stoy, and at that time expressed the hope that he would be with us in the same position as long as we held our conventions here, but as you are probably all aware, Mr. Stoy was taken away from us July 22, 1911, at Wernersville, Pa. The American Railway Master Mechanics' Association owe a debt of gratitude to him for the lively interest he took in our comfort and welfare, and I cannot allow this opportunity to pass without adding a tribute to his memory.

With the tremendous growth of the Association during the past few years, considerable criticism has been heard from various quarters as to the increase in cost, extent, and

amount of entertaining done by the Supply Men's Association, and some people have felt that the formal functions were increasing in formality and the expense was becoming burdensome.

At a joint meeting of the executive committees of the M. C. B., A. R. M. M., and Supply Men's Association, held at New York, October 24, 1911, the question of entertainment was fully discussed, and the committee expressed itself as being under great obligations to the Supply Men's Association for the splendid manner in which they had catered to our pleasure in the past, but it was felt that we could no longer expect them to carry all of the burden and arrangements were made to dispense with the most formal features, such as the reception and ball, substituting informal dances, concerts, etc., where people could thoroughly enjoy themselves; in doing this it was felt that the members and their families would get better acquainted, which is something very much to be desired, and it is sincerely hoped that every one will do their utmost to make things pleasant for one another.

In regard to the cost of entertaining, it was decided that

DONALD R. MacBAIN,
Third Vice-President, M. M. Association.

ANGUS SINCLAIR,
Treasurer, M. M. Association.

our Association would bear its share with the M. C. B. and Supply Men's Association, and thus relieve the latter association of an expense which properly does not belong to it.

The question of consolidating the two association has been discussed since the last convention, but the feeling of the members generally, appears to be against anything of the sort being done; the thoughts expressed are to the effect that after forty-four years of good service, it hardly seems wise that the American Railway Master Mechanics' Association should lose its identity. It was my thought, however, that the wo conventions could be held in one week, Monday and Tuesday being set aside for the Master Mechanics' meeting; Wednesday for a joint meeting of the two associations to discuss matters of common interest, and Thursday and Friday for the Master Car Builders' Association. The principal reason for consolidating is to reduce the time away from business, the present arrangement breaking into two weeks for those attending both conventions, but by handling it as suggested, the duplication of work would be avoided by the joint session, and only five days would be taken up with both meetings.

A suggestion was made on the floor of the General Foremens' Association last year that the members be allowed to investigate and report to the Master Mechanics' Association upon matters pertaining to shop methods and practices, the statement being made that there might be numerous details in shop organization which we were desirous of obtaining information about, but for lack of time had to pass up, and which they were willing and anxious to investigate and report on if asked to do so. This offer was laid before the executive committee who will probably take advantage of it.

Apart from the experience gained at our meetings through the discussion of the various subjects presented, the opportunity for exchanging ideas among members, when outside of the Convention Hall, is great. I am a warm advocate of meetings of this kind, and know personally that valuable information can be obtained from people who have, perhaps, gone through some experiences that we are lacking. As expressed at various meetings and places, I believe we should insist on our men attending conventions; it broadens their ideas, gives them new thoughts and puts fresh life into them, so that on their return to business they are better able to grapple with the problems that confront them.

I was fortunately able to attend the annual convention of the International Railway Fuel Association in Chicago last month, and listened to some of the best papers on the proper firing of locomotives, proper drafting of locomotives, etc., that I ever heard; the discussions were entered into with enthusiasm, and it was, throughout, a real live convention, our master mechanics and road foremen who attended going away with new ideas for the economical use of fuel in locomotive service. For a four-year-old association it is making wonderful strides, and it is deserving of encouragement.

The question of promoting safety in the operation of railways

has received a tremendous impetus lately. About eighteen months ago an organization was started on the Chicago & North Western Railway, in a very humble way, for the purpose of trying to reduce the number of accidents that were occurring daily on our tracks, in the movement of trains and in our shops and roundhouses. The plan worked out so well under the forceful leadership of the general claim agent, and with the assistance of the members of the central safety committee and the local committees on the various divisions, and the results were so gratifying, that the scheme was quickly taken up by all of the large roads in the country, and now, fortunately, nearly everybody has acquired the "safety" habit, or as one road tersely sets forth, "It is better to be careful than crippled."

At one time it was thought that most accidents were inevitable, but when live safety committees got into action it is remarkable how quickly this idea changed, and a reduction in 16 months (the latest date for which figures are available) of 107 persons killed and 3,996 persons injured on the Chicago & North Western, shows what can be done when men make up their minds that it is better to cause a delay than to cause an accident. The fact that it is possible to make such a remarkable showing has induced the railway commission of Indiana to ask all the roads in that state to go and do likewise. Before long the Federal Government will probably step in and call for some action that will help this good cause along; if it would only pass a trespass law and enforce it, a large number of the 5,000 men, women and children who are now being killed each year, because of the dangerous track walking habit would be saved.

The past winter has been the most severe in years, as most of us know to our sorrow, and now that summer is here, we must remember our weaknesses and fix our fences before another winter comes along. In the summer we are liable to forget the cold weather, but that is the time to remember it, and taking advantage of the experience gained, to profit by it. It is only by having the engines and roundhouses in first-class condition that the best results can be obtained, and I am sorry to say when the weather is warm we are likely to forget some of the things we promised to do when we were in trouble.

The last year has seen some serious labor difficulties which fortunately are now a thing of the past. The coal strikes in this country were settled without the serious conditions that existed abroad. The engineers of the eastern lines made demands for certain increases, which are being settled by arbitration.

The Federal boiler inspection bill has now been in operation nearly a year, and, generally speaking, we have become accustomed to its provisions and requirements. The extra expense involved is enormous, but, if through its operation the maximum safety is gained, it will be money well spent. There appears, however, to be a number of differences in the rulings made by the Inspectors, which is to be expected on account of so many new men being employed, and I believe a committee should be appointed to wait on the chief inspector, to try and bring about greater uniformity, discussing some of the things with a view to a better understanding being arrived at, and also to suggest that we dispense with having to do things that do not improve the safety of the boiler at all. Some of the inspectors' reports sent to our general officers from the chief inspector, cause considerable worry and anxiety, from the fact that they assume, when a report is sent from a government inspector, that their attention is being drawn to some infraction of the law, or a dangerous condition we are allowing to exist, whereas it may be only a statement referring to some trouble that is not covered by anything in the law itself, or the rules laid down for our guidance. It is perfectly proper to report all cases where the law is violated, but the fact that a flue is leaking on an incoming engine, or some other equally trivial defect exists, should not, it seems to me, be sufficient cause for a government report to be made, especially to our general officers.

The progress in locomotive construction appears to have kept pace with the requirements, but nothing of a freakish design has been seen. The most radical departures noticed are the turbing locomotive, built and put in service at Milan, Italy, and the turbine electric locomotive constructed by the North British Locomotive Company. Dr. Diesel is also reported as having designed an electric locomotive, the generator being operated by a Diesel engine. So far, however, nothing definite has been heard of their performance.

The question of fuel economy is of greater importance than ever. The railways and locomotive builders, however, have had this before them, and a large number of Mikado engines have been built, which while pulling very little more tonnage than a consolidation engine, have done it with a decrease in coal consumed for the work performed.

In some places Mallet engines have displaced consolidations with remarkable success in the way of increasing the train load, reducing the number of trains, and doing the work with a reported saving of more than 40 per cent. in the amount of fuel burned over other engines engaged in similar service.

The superheater engine has given a good account of itself during the past few months, and the results obtained last winter, were, generally speaking, very satisfactory. While we have had troubles on account of lubrication, headers leaking, etc., we are overcoming them successfully for the reason that our education has been improved by our difficulties and where regular men are employed, they soon become familiar with the different conditions brought about by the higher temperatures, so that no more trouble is experienced with superheater than with saturated engines, the improved results justifying the regular crewing of power, where possible.

Several switch engines have recently been equipped with superheaters and excellent results in the way of fuel and water economy are reported. It would seem that the best results in superheating could be obtained by an engine that is working practically up to its capacity most of the time, and not one in switching service, working intermittently, as most of them do, but the satisfactory service reported as being obtained by superheater switch engines would indicate a field for the device in that kind of work.

While nothing very new has been developed in the stoker line, steady progress has been made with the few that we consider have passed the experimental stage, and a number of Mallet engines have, during the past year, been equipped with them, in one case over 9,000 lbs., of coal per hour having been fed into a locomotive firebox by a mechanical stoker.

The question of efficiency in our shops has not been lost sight of. Careful investigations are constantly being made tending to increase our output and decrease cost, and in this we are being ably assisted by the tool and machine manufacturers, who are very much alive to our requirements.

The headlight question is still a very serious one for us; lack of uniformity in state and railway requirements making it difficult to know what to do for the best. The difference of opinion among railways as to what should be used is perhaps justifiable, for the reason that what would be entirely satisfactory on a busy double or four track road with block signals, might not be suitable for a single track road with very little traffic and no automatic signals, and it would be far better for the various states to call for a minimum requirement, that would be low, so as to be suitable for a double track road, and then those roads that felt a brighter light was necessary in certain sections, could provide it.

There appears to be considerable progress in the welding up of locomotive broken parts, firebox sheets, etc., by the use of electricity and oxy-acetylene, and a large number of engines that would ordinarily have required new firebox sheets have been kept in service by repairing defects in the old ones. The welding of flues in place is probably going to be a solution of the failures due to flues leaking.

Considerable interest is being taken in the tests of boiler fireboxes of different designs at Coatesville under the direction of our good friend, Dr. Gross; but so far, results of these tests are not forthcoming and we cannot yet say whether the standard design of box will have to give way to one of entirely new shape and form.

Elaborate locomotive tests have been made on the Altoona testing plant in connection with the Chicago committee on smoke abatement to see what effect the different locations of air tubes with steam and air jets in the side of the firebox will have on the amount of smoke emitted; also what benefit is derived from brick arches, air openings in firebox door, etc. When the results of these tests are tabulated, a very useful work will have been accomplished.

The association has a membership of 1,085, which is an increase of only 25 over last year. I believe that all members should try and get this up to 1,300 before another convention takes place.

The National Conservation Congress invited the American Railway Master Mechanics' Association to send a representative to meet with it as a member of an advisory board, and your executive committee instructed me to accept the invitation and take part in the deliberations. The first meeting was held at St. Louis, Saturday, May 11, at which time it was learned that 35 national associations had accepted the invitation to act on this advisory board, which was formed to co-operate with the executive committee and suggest means for furthering conservation in all directions. While the original scope of the congress was to conserve the national resources, such as minerals, water, forests, etc., it was decided at this year's convention that it would be entirely proper to branch out and make a special effort in the direction of conserving vital forces, and this plan of conservation will be brought into prominence at the next meeting.

Questions were asked the attending members as to what

their associations were actually doing in the way of conserving our national resources, and for our association I was able to tell of the improved designs of locomotives that performed a given amount of work with less fuel than other engines of earlier types; the greatest stride in economy that had been made since railways were first put into use was the superheater, which makes a possible saving of nearly one-fourth of the amount of coal used while the engine is working. Also told them what the various railway safety committees were doing in the way of conserving vital forces, and urged the passing and enforcing of trespass laws so that the annual toll of more than 5000 men, women and children killed while trespassing, could be stopped, or at least materially reduced.

In conclusion, I sincerely hope that our visit here will be beneficial to the companies we work for, and that the few days spent at the seaside will so brace us up that on our return to business we will take a fresh hold of things and accomplish so much more that our short absence from duty will be greatly offset by the new ideas put into effect, greater vim and vigor injected into the business, and, in fact, a general improvement in all directions.

ASSOCIATION BUSINESS.

Secretary Taylor presented his report which showed that the present active membership is 1,024, the associate membership 21, and the honorary membership 40, making a total of 1,085. Te report of the treasurer showed that the association had purchased 50 New York City 4¼ per cent. bonds for $5,187.17, and that there is a cash balance on hand of $1,533.38.

The report of the secretary and treasurer was referred to an auditing committee made up of J. W. Fogg (B. & O. C. T.); W. E. Dunham (C. & N. W.), and C. H. Rae (L. & N.).

The dues for the current year were fixed at $5.00 per vote as heretofore.

F. C. Thayer, general road foreman of engines, Southern Railway, was present as a guest of the association, representing the Travelling Engineers' Association. He was given the privilege of the floor.

ADVISORY, TECHNICAL.

G. W. Wildin (N. Y., N. H. & H.), chairman: The committee has discussed this matter in its various phases, and we seem to stand in about the same position as we did a year ago. The failure of the two associations to consolidate, has, in a great measure, handicapped this committee, and as it will be almost useless for the Master Mechanics' Associations to have the committee, as recommended in my address of 2 years ago, to represent the mechanical fraternity, as well as the Master Mechanics' Association, and also the fact that the chairman of the committee on railway operation and legistation has in the past year selected men to perform just about the same work, and selected them more with reference to geographical location, which will make it easier for them to get to, and from the place of investigation, I don't know but what this is probably about the best way to handle it at this time; and we feel that the matter should be dropped at this time, and recommend that the committee be discharged.

J. F. DeVoy (C. M. & St. P.): I recommend that the report of the committee be accepted, and the committee discharged with the thanks of the association. (The motion was carried.)

MECHANICAL STOKERS.

The committee pointed out last year that the principal benefit to be derived from the utilization of a perfected stoker fulfilling the requirements specified was the realization of the maximum boiler capacity of locomotives with the ultimate result of increasing their hauling capacity and reducing their cost of operation per ton mile of service rendered.

The actual service performance of two stokers complying with the specifications laid down in last year's report, as developed by extensive inquiry among railways who have heeded the committee's request by lending their aid and installing a limited number upon large locomotives, justifies the committee in now reporting that these two stokers have, in a measure, fulfilled its expectations, inasmuch as the indications are that their service has been sufficiently reliable in practical operation on a large number of heavy locomotives. These stokers are the Crawford Underfeed Stoker, which was described in the American Railway Master Mechanics' Association Proceedings for 1910, volume XLIII, and the Street Overfeed Stoker described in the American Railway Master Mechanics' Association Proceedings for 1910, volume XLIII.

Both types of stokers in successful service to-day maintain the same general principles in design originally employed. The improvements made on them, which resulted in making their operation practicable, are improvements of detail only, such as would result from the knowledge gained of the weakenesses of individual details brought out by actual service.

As the greater sustained tractive efforts of the large engine equipped with superheaters and brick arches is gradually taken advantage of, its fuel consumption per hour will increase, though decreasing on the ton-mile basis, with the eventual result of possibly making necessary to some extent means, in addition to those already provided, to supply fuel to the engine up to its maximum requirements. When this condition develops, as it is bound to, by traffic increases, careful investigation of tonnage ratings, and the raising to a higher standard the efficiency of operation, the demand for a perfected type of mechanical stoker will become more acute than ever. It is, perhaps, somewhat of a good fortune that the superheater has stepped in and tided over the difficulty that would have resulted while the stoker was in process of development and the demand for large engines becoming more insistent.

CRAWFORD UNDERFEED STOKER.

This stoker, in service on the Pennsylvania and the Baltimore & Ohio, has been developed into a practical operating machine, and is being applied to all of the large Pacific type

T. RUMNEY,

Chairman, Committee on Mechanical Stokers.

class K-2 passenger locomotives and the consolidation class H-8-C, freight locomotives building for the Pennsylvania Lines west of Pittsburgh. On these lines forty-five locomotives are now equipped, and twenty locomotives under construction are being equipped. The Lines East have ten locomotives equipped. The Baltimore & Ohio reports one Crawford stoker in service on a Mallet engine with a grate area of 100 sq. ft., and a tractive power of 105,000 lbs., working compound.

The forty-five locomotives on the Pennsylvania Lines West, which include some of the earlier designs, have made a total of 7,361 trips up to the middle of March, of which 3,640 were 100 per cent. stoker fired, 2,082 between 75 and 100 per cent. and 1,639 below 70 per cent. The per cent. stoker fired is in reference to the amount of coal put into the fire box by the stoker; as for instance, a 90 per cent. stoker fired trip means that the stoker fired 90 per cent. of the coal while 10 per cent. was hand fired, the firing by hand being done to fill up spots in the grates which resulted from imperfect distribution of the coal by the stoker. Some capacity tests on the Western Division of the Lines West were run with a dynamometer car on various passenger locomotives, one of which was a Pacific type equipped with a Crawford stoker. The results of these tests have not been completed so as to become available for this report, but the preliminary figures indicated, with respect to the coal con-

sumption, that the stoker made as good a performance as the skilled fireman selected for the hand-fired locomotives.

The Crawford stoker applied to the Mallet engine of the Baltimore & Ohio has been in service about a year. Some difficulty was experienced with this stoker due to the fact that some departures in design were made from the stoker as originally developed, consisting principally in the provision of two cylinders to operate the plungers instead of one. This necessarily added certain complications which subsequently gave trouble. After certain changes, the stoker gave a fair distribution of coal. This stoker is still in service but has not given quite the satisfactory performance so that it could be termed unqualifiedly successful. Inasmuch as this particular stoker is a modification of the Crawford stoker as now perfected for engines of the type to which it has been applied on the Pennsylvania Lines, some difficulty, as experienced with it, might reasonably be expected.

STREET OVERFEED STOKER.

This stoker is now being built in two somewhat different forms, distinguished from one another as the screw conveyor type and the crusher type. The screw conveyor stoker is built to take screened coal from the tank and distribute it evenly over the grates in the firebox without being handled by the fireman. The coal used by this machine must be passed through a screen having 2-in. square mesh before it is placed on the tank. With this type of machine the fireman has no manual labor to perform excepting that of raking the coal on top of the screw conveyor when the supply in the tank is low.

The crusher stoker is designed to take lump, run-of-mine, or slack coal from the tank and distribute it over the grates in the firebox. With this type of machine, all the coal must be scraped or shoveled into the crusher by the fireman. The parts of the stoker on the back boiler head and the distribution systems are the same with both machines. The primary difference between them is in the means provided for conveying the coal from the tender to the distribution system, the screw conveyor type only needing one engine to operate the entire machine, whereas the crusher type needs two; one for the crusher, the other for the conveying mechanism.

It is the opinion of the designer of the Street stoker that the provision of means for preparing coal on the tender for suitable firing is but a temporary expedient to be used with experimental machines, and that for practical operation of a large number of stokers, it would be more feasible to prepare the coal at the chutes suitable for stoker firing before delivery to the tender. The committee last year recommended that a stoker, in order to be complete, should be able to handle run-of-mine coal. In this respect the Street screw conveyor of stoker does not meet the committee's recommendations. The indications, however, are, judging from recent developments, that it will be more economical to concentrate the means for properly preparing coal for stoker consumption at the coal chute with the net gain of reducing to a minimum the complication of a machine which, when applied to a locomotive, will of necessity add to the expense of locomotive maintenance and the likelihod of engine failure.

There are 30 Street stokers applied and in service today, 13 of which are of the crusher type and 17 of which are of the screw conveyor type. Sixty-nine stokers of the screw conveyor type are under construction for application to 45 Mallet engines ranging in tractive power from 72,800 lbs. and 99.5 sq. ft. grate area to 105,000 lbs. tractive power and 100 sq. ft. grate area, and 24 Mikado engines of 60,800 lbs. tractive power and 66.7 sq. ft. grate area. The thirty stokers in operation are applied to engines ranging in size and type from 45,700 lbs. tractive power consolidation freight, 58,000 lbs. tractive power mountain passenger, and 60,700 lbs. tractive power Mikado freight to 105,000 lbs. tractive power Mallet freight and pusher engines. At the last convention of this Association, eight of these stokers were in operation. From the service rendered by them, as well as the results of individual investigations made by various roads, this number has grown to 30, with 69 under construction for entry into service within the next few months.

General inquiry of different roads which have the latest type of Street stoker in service has developed the facts that its service is satisfactory, as indeed is attested to by the extension of its use; that it permits realizing the fullest capacity of the locomotive boiler; that it permits of carrying a thinner fire than ordinarily possible with hand firing; that with considerate attention, it renders practically uninterrupted service; but that it does not necessarily effect economies in fuel consumption. The fact was also developed that the greatest trouble in the operation of this stoker results from the unfamiliarity of engine crews with it at the time of introduction. It takes considerable drilling to get a sufficient number of men on a division trained so that the stoker may be handled successfully in pool service. This difficulty, however, is a minor one, and naturally follows at the outset of the use of a device new in railroad service. As the stoker becomes more generally utilized, this trouble will disappear.

HANNA OVERFEED STOKER.

This stoker, as far as developed, was briefly reviewed in the Proceedings of the American Railway Master Mechanics' Association for 1911, volume XLIV. It did not fully meet the requirements of the committee. As a coal-distributing means, the Hanna stoker has successfully demonstrated its possibilities. It has been in continued service on engines of the consolidation, Pacific and Mallet types, giving a good account of itself, particularly when the engine crews tok a personal interest in its operation. The manufacturers of the Hanna stoker are revising its design and construction so as to increase the scope of their apparatus to comply with the specifications as laid down by your committee.

THE BARNUM UNDERFEED STOKER.

This stoker as developed so far by the Chicago, Burlington & Quincy employs screw conveyors located in troughs extending longitudinally just below the grates. The screw conveyors decrease in diameter from the rear of the firebox to the front. Above the conveyors in each trough are a series of inclined plates, adjustable for height and inclination. The clearance between the conveyor and the bottom of the trough may also be adjusted to secure the best results. The conveyors are operated by a transverse worm shaft under the cab deck which is rotated by two small steam engines secured ont the outside of the frames. A coal crusher on the latest type of stoker as applied to five 2-10-2 type engines recently built for the Chicago, Burlington & Quincy is also provided. This crusher is driven by a small steam engine located on the tender. It delivers coal to a belt conveyor which transfers it to a transverse trough from which it is discharged into the longitudinal feed troughs.

In addition to the five 2-10-2 type engines equipped above, the Barnum stoker has been in service on a switch engine of the Burlington road operating in Chicago, as well as a Prairie type engine operating in freight service. It is reported as having good results with both low grade bituminous coal and lignite. It is further reported that the indications at this time for this stoker are that it is a practical machine, assisting in making steam readily and being free from failures and breakdowns.

DICKINSON OVERFEED STOKER.

This stoker was tried out on the Erie. It employed the fundamental principle of coal distribution of the Hayden stoker further developed. It was equipped with a coal crusher and means for conveying coal, consisting of a screw conveyor transmitting the crushed coal to a bucket conveyor encased in a housing, which bucket conveyor in turn delivered the coal to the distributing mechanism. The apparatus was so arranged that it did not in any way encumber the fire door. The entire machine was driven by two small steam engines, one operating the crusher, the other the conveying apparatus.

The conveying mechanism as well as the distributing device of this stoker were successful, but the coal crusher failed, due principally to its inadequacy. The engines, together with a few minor details, gave considerable trouble, although the complete combination gave a good showing when in proper repair. For it to be maintained in this condition, however, proved very expensive.

From the experience gained from the above stoker, a second one was designed and built, seeking to avoid all the weaknesses of the first while incorporating all its good points. The modified stoker, as finally placed into operation, used only one engine of a special slow speed design, special form of boot, for the elevator carrying all the gearing to avoid encumbering the engine, an improved conveyor, a suitable coal crusher, and better coal distributing means. This stoker was finally placed into operation during the month of February last, applied to a consolidation freight engine. It soon developed that snow and moisture in the coal presented new difficulties by causing the fine coal to dry and cake in the elevator buckets, gradually filling them up, which so diminished the elevating capacity of the conveying mechanism that it clogged and stopped, finally resulting in a failure by breakage of the elevator chain. This trouble was probably due to wrongly designed buckets,

since the bucket elevating system as employed in the Street stoker works without trouble. During the operation of the stoker, steam was satisfactorily maintained and the apparatus worked smoothly. It is now proposed to do away entirely with the bucket elevator scheme and substitute in its stead helical screw conveying means.

CONCLUSION.

Generally speaking, in consideration of the foregoing review of the status of the mechanical stoker, the committee feels justified in concluding that decided progress has been made during the last year in the development of the mechanical stoker. While the perfection of the superheater and the brick arch have assisted in making possible a larger engine, it is considered, judging from these indications, that the advent of the perfected mechanical stoker will make possible a still larger engine.

The report is signed by:—T. Rumney (C. R. I. & P.), chairman; E. D. Nelson; C. E. Gossett (M. & St. L.); J. A. Carney (C. B. & Q.); T. O. Sechrist (C. N. O. & T.); S. K. Dickenson (L. S. & M. S.), and George Hodgins.

DISCUSSION.

W. C. A. Henry (Penna. Lines West): There are in use on the Pennsylvania Lines East and West at the present time, 75 of the Crawford stokers. The performance of these stokers has been so satisfactory that the Lines West have recently ordered 37 heavy freight and passenger locomotives equipped with these stokers. We find we are realizing more power from the locomotives equipped with the stoker than in the case of locomotives where hand firing is used, and altogether our experience is that the stokers are very reliable. On the lines in the southwest we have 10 Pacific type locomotives, which have been equipped with the stokers. During the month of May, 97 per cent. of the coal burned by these locomotives was handled by the stokers, and the remaining 3 per cent. was handled, as explained in the report, in the leveling of the fire, etc. These engines are not assigned to regular crews, but run in a pool.

T. R. Cook (Penna. Lines): We have some figures here showing the results of the performance of the stokers on the lines West that might be interesting. The total number of trips over and above those reported by the committee, is now 11,726, of which over 6,000 were 100 per cent. trips. The detail of the last 2 months performance, I believe would be of interest. The stokers on the Pacific type engines in the last 2 months made 992 trips, out of which 682 were 100 per cent. trips. The consolidated engines with the stokers made 837 trips, out of which 566 were 100 per cent. trips.

We have also on some of the consolidated engines the new design of stoker which has departed from the original design in some of the principal features, *i. e.*, in the surface of the grate. The original stoker had a flat grate. The No. 17 stoker, so called, has a sloping grate, that is, the grate slopes towards the center, with a basket effect. In these engines we have been able to carry a much lighter fire, and a fire which is much more evenly distributed. That stoker has been doing very well. It was only equipped within the last 4 or 5 weeks and the engine has made 41 trips, of which 36 were 100 per cent. trips.

J. F. DeVoy (C. M. & St. P.): Mr. Henry referred to the fact that an engine equipped with a stoker developed greater power than the engine which was fired by hand. I would like to ask if he has made any tests, and can give us any relative information as between the 2 forms of firing, the amount of coal saved in firing, or the increased amount of power derived from the application of the stoker over hand firing. The reason I ask that question is that in a stoker which we tried out a year or two ago, it did not develop the fact that the stoker would increase the capacity of the boiler to any great extent, that is, compared with the hand firing, and for this reason I would like to know if there were any comparisons made by Mr. Henry along these lines.

Mr. Henry: Tests of these locomotives were made on the locomotive testing plant at Altoona, Pa., on which tests 9,400 lbs. of coal were burned an hour. The road tests which we have made indicate that by the use of the stoker, in comparison with hand firing, we get an economy of from 5 to 7 per cent., that is to say, the same amount of work is performed with the stoker, with 5 to 7 per cent. less coal, as is performed by hand firing. Our road foremen of engines also tell me that the Pacific type locomotives equipped with stokers make their schedules more easily, and make up lost time more quickly, than engines which are hand fired.

C. D. Young (Penna.): I believe that I can furnish some few figures on the relative capacity of the hand fired engine, or the possibilities, perhaps, of a stoker fired locomotive vs. a hand fired engine. The committee has referred to the application of the Crawford stoker to the Baltimore & Ohio mallet compound engine. I believe that was the first attempt that was made to apply an underfeed stoker to a fire-box greater in width than 100 in., and the problems involved in the construction were very serious, and required some experience, as we afterwards learned, before the problems could be fully met. The performance of the B. & O. stoker gave the designers a great deal of information upon which to base future designs, and with the errors and difficulties of the wide fire-box engines before them, as the result of the application to the B. & O. Mallet, the Pennsylvania road has incorporated on their Mallet simple locomotive & Crawford stoker.

In testing this locomotive out on the Eastern slope between Altoona and Gilitzen, a distance of a little over 13 miles, on a 2 per cent. compensated grade, it was necessary to fulfill the requirements of the locomotive, to burn an average of over 11,000 lbs. of coal per hour. This the stoker did. We are rather inclined to believe, from our experience when the stoker has not been operating satisfactorily, that it would require 2 men to successfully keep the fire going burning coal at that rate, and with a single fire door, it would be even very difficult to have 2 men keep up full steam pressure under maximum working conditions, so I think in the case of this application it is fairly safe to say that the application of the underfeed stoker has permitted the maximum capacity of the boiler at low speed.

We have also applied the stoker to another Mallet compound, which is just about to be delivered from the Baldwin Locomotive Works, and that will be tried this summer, when we will know more about the performance. This machine is different in detail, but the same in fundamental design, from that applied to the B. & O. Mallet compound, and the Pennsylvania Mallet simple. In addition to that, we have applied the type of stoker which Mr. Cook spoke of, with the sloping grate to an experimental Pacific locomotive which we have had for some few months, and have tested frequently on the locomotive test plant, having made a series of some 50 odd tests. I believe that this locomotive represents the latest development in heavy Pacific design. It has 27 in. by 28 in. cylinders, and I believe is about the heaviest 80-in. wheel passenger locomotive which has ever been built. During some of the runs on the testing plant we have burnt a large amount of coal and have developed as high as 2,000 boiler h.p. in the boiler, the boiler being equipped with a superheater and a Crawford stoker. The engine indicated, for sustained power, something over 2,500 i.h.p., which I believe establishes a new record for any passenger locomotive. When the members consider this engine will develop 2,500 i.h.p. and give an evaporation sufficient to be rated as 2,000 boiler h.p., they will appreciate that it is quite a large machine. The engine has not been in service on the road long enough to be put on our heaviest and fastest trains, but we have been breaking it in and trying it on some of the slower trains. The results have been equally satisfactory on the road as on the testing plant, and we have been very much satisfied so far with the results of the operation of the engine.

Thos. Roope (C. B. & Q.): We have done some experimenting with the Barnum stoker, and as far as we have gone with it the results have been satisfactory. We have tested it with both bituminous and lignite coal, and, as you all know, the lignite coal is very light. We find with the Barnum stoker that we are able to maintain maximum steam pressure at all times. It is a splendid device for abating the smoke nuisance. The stoker, I might say, is very popular with the enginemen that have used it. I have been on a locomotive that we have been testing on the Lines West under adverse conditions, and in all kinds of weather, and in all the trips I personally made on the locomotive, the results were very satisfactory.

A. G. Trumbull (Erie): Lately we have devoted considerable attention to the Brewster stoker. Some of the difficulties to be encountered in the operation of that stoker, of course, might be anticipated in connection with the vertical conveyor inside the firebox. We find it rather impossible to operate the stoker on account of the action of the heated gases, on the cast iron conveyor, and after considerable effort to develop means whereby the conveyor could be protected from action of the smoke gases, we were obliged to abandon the experiment. Thus far we have no means whatever of overcoming this difficulty. I think, perhaps, there may be a future for this stoker, if the difficulties enumerated can be overcome.

F. H. Clark (C. B. & Q.): I have an idea that the stoker is going to help us to get the full capacity of our boilers. It is a pretty difficult matter to meet all the requirements called for in firing a locomotive. With some stokers that have been offered, the question of distribution is one of the most serious difficulties that is encountered. We have sev-

eral stokers on the road now that appear to be doing very well. We have a Street stoker in service in one of our big Mallet engines, with a grate area of about 100 sq. ft. and somewhat to our surprise it made a successful first trip. We are going on and putting some more stokers on that class of engines, as we are very much encouraged from the experience we have had with the first stoker, and which has now been in service perhaps a week, and of which we have heard nothing as yet but good reports.

H. F. Staley (C. C. & O.): I have had in service for about one year one of the Hanna stokers of the older type, applied to a Mallet engine having 78 sq. ft. of grate area. With the use of this stoker I find we can maintain a maximum steam pressure at all time while the engine is working at full capacity. We have experienced some trouble with this engine in regard to its steam capacity while running light, due to the fireman improperly handling the stoker, by the application of too much coal to the fire or feeding the coal to the fire faster than the engine was capable of burning the coal. I consider that this stoker will distribute the coal uniformly over the grates, and with its use we can successfully burn a lower grade of coal, and maintain a maximum steam pressure, much more satisfactorily than can be done by hand firing. The Hanna stoker can be used without a brick arch, and in our case no brick arch was used.

W. H. Williams (B. R. & P.): I do not understand why the Street stoker men are so quiet. I rode on some Chesapeake & Ohio engines which were operating very successfully with the Street stoker. We have a large Mikado engine which has been in service something over three months, in which the Street stoker has been operating all the time without failure.

C. F. Street: I think the committee's report covers the situation in very good shape. I now feel that my machine has passed the experimental stage. I am now running about 150 machines. These are in the service, and all of them are giving satisfaction.

T. Rumney (C., R. I. & P.): Of course, it makes a vast difference as to the size of the engine—whether the stoker works on a low grade line or in a rolling country, and particularly where the limiting grades are short. One of the most important things to be considered is the size of the engine and what work a fireman can do, and also as to various other devices, covering certain classes of service, by which we could decide whether a stoker is necessary or not.

G. H. Baker: Some attention has got to be given to getting men into locomotive service with intelligence and brains, as well as muscle. We have got to have engineers after a while and we have got to make them out of firemen. We have got to make the conditions of firing locomotives such that intelligent young men can be persuaded to enter the work and stay in it, and not be driven out of the service by the hundreds after the first month or two. I think the mechanical stoker has been found to be doing a great deal of good work in that direction, permitting the use of big engines where big engines are needed, and the maintenance of their power in emergencies and hard work up to the maximum.

C. D. Young (Penna.: The question that Mr. Rumney asks is a very important one when a person is trying to decide whether they shall put a stoker on an engine or not, and one exceedingly difficult to answer, it seems to me. Now, the problem on that account depends on circumstances. We have some data which I believe is fundamental on the subject of the firemen. It has been worked up with that in view, and I believe it would be very interesting to the association to know what has been done by firemen, proving what at least can be done, and then from those figures perhaps we might be able to judge what an average man might be expected to do. Last Summer and last Fall some capacity tests were run between Ft. Wayne and Valparaiso, a distance of 105 miles, the idea being to determine just how many cars could be hauled on a given schedule speed. Everything was in good shape for the experimental work. The road foreman recommended a man who has broken all records in handling fuel on the deck of a locomotive. He had fired for 3 hours at speeds greater than 60 m. p. h., an average of 8,400 lbs. of coal per hour. I believe that establishes a record which, unless he tries it over again, will not be beaten. Not only did he do that, but he would go back and do it over again. His work was done with a No. 5 shovel. Had he been given a larger shovel, I believe he could have exceeded those figures. We have had men on our locomotive tests plant fire as high as 9700 lbs. of coal per hour. Now, these are maximum figures, I believe you will all agree with me that we should not expect very much more. We know time and again, men who are firing 3,000 lbs. of coal per hour for a 6 or 8-hour run on the road, and they are doing all we can reasonably expect of a single fireman. I don't believe we can expect from the present day fireman operating a passenger engine, anything greater than 4500 to 5,000 lbs. of coal per hour.

Mr. Street: A fireman told me that he had been firing a consolidation locomotive of comparatively small capacity for 6 years, and when he was given a stoker he put in a full month on the stoker, which was the first full month he had ever put in on one of these locomotives. He said there was not a fireman on any of these locomotives that will work continuously a full month. They must all lay off and rest up for a while. Now, these men were not shovelling more than between 2,500 and 3,000 lbs. of coal per hour on heavy freight work. That is a very indefinite proposition, I understand, but before the next session of the convention, I think we will be able to give positive figures. One of the things which has surprised me greatly is the small quantity of coal required in comparison to what I expected. In a number of cases we have slowed down the speed of conveyor for delivering coal to a point which is much lower than we had anticipated. We have not yet made tests to determine just the quantity which is put in.

Angus Sinclair: It has been said that superheated steam would do away with the need of a mechanical stoker, which is taking a rather short-sighted view of the question. The fact is, when we consider the way in which the size of locomotives has increased; what the maximum of a locomotive may be and what the maximum demand for steam may be, the importance of the stoker is evident. Now, on the Southern Pacific I know for a fact that there are oil burning engines using 150 gals. of water per minute. You have to look forward to getting your coal-burning locomotives up to the capacity of oil-burning locomotives, and if that is the case, it is far beyond the capacity of any man to fire them. For this reason, I think that the demand for a mechanical stoker is liable to increase.

T. Rumney (C. R. I. & P.): Just another item in connection with the use of the stoker that is not being emphasized particularly, and that is a grade of coal that you can use with a stoker. We are burning in some cases washed slags that a man could not possibly fire by hand.

H. A. Gillis: We have a number of stokers doing good work to-day, but there is one thing that has not been brought out and that is in regard to the fireman. I have done some firing myself, and I know the question of the human element does come in. I don't care what a man's physical ability is or what his capacity is, there are times when a man is not fit to do the work. There are times when the temperature is such that hardly any man can fire and make any time.

D. F. Crawford (Penna.): I have naturally thought a great deal about the question Mr. Rumney asks as to what size locomotive we could stop at. We naturally started with the application of the stokers to the heaviest locomotives in the equipment. It has been my idea to work backwards, and take first the largest locomotives we have, then the next size consolidation locomotive, and then go to the locomotives that may be called the lighter passenger locomotives, say a 20½ in. by 26 in. cylinder. I want to do that for two reasons: I hope to gain more efficiency or save fuel, I don't know that I will on the smaller; I also hope to so greatly eliminate the smoke that our suburban trains in coal burning districts will be comfortable to the passenger, and I think that is a point we have got to think of a good deal when it comes to the smaller locomotives. If we succeed in getting a stoker that will reduce the smoke, it will not only be useful on the large locomotives, but on the small locomotives, around terminals. In regard to the determining of the capacity of locomotives; we took some 6-wheel truck cars and loaded them with steel rails until they weighed 62½ tons. We made a schedule of 100 minutes for 105 miles, and started in with trains of 5 cars and worked up to 15 cars. With 15 cars we averaged 58 m. p. h., and with 9 cars we averaged 76 m. p. h.; and the fireman that Mr. Young speaks of was able to handle the amount of coal that he has stated. I found, however, in comparing the daily performance of the two classes of locomotives, one of about 39,500 lbs. tractive effort and the other of 42,000 lbs. tractive effort, the larger engine having a larger boiler, and what we thought more steaming capacity, that the man used about the same amount of coal on both of these engines. It was somewhere in the neighborhood of 3,500 lbs. of coal per hour in freight service, and for a run that extends the same as ours did, for 10 hours, it seems to me it is pretty near the limit; and therefore, from a coal burning standpoint I have thought of applying the stoker to all locomotives that require over 3,500 lbs. of coal per hour.

John Tonge (M. & St. L.): I would like to know if the railway companies are making comparative tests. Now, if there is 5 per cent. to be saved in fuel, it is certainly worth while to have a stoker. I think that the discussion this morning has not been as interesting as it ought to be for the reason that not enough mention is made of the power of the engines using the stoker. There is a preponderance of small power engines, and we ought to consider them if we are looking after money or economy.

A Member: In Pennsylvania we have had 4 consolidation engines in service for less than 3 months. We have been experimenting with the coal. The stokers are new to us, but so far the engines are able to go 45 miles without using a shovel, or without using a hook, the engine in that time burning at the rate of 5,000 lbs. of coal per hour, with a maximum grade of 1 per cent. and a steam pressure of never less than 200 lbs. up to 205 lbs.

C. H. Hogan (N. Y. C. & H. R.): One of the most important reasons for this association and the mechanical men of this country encouraging those advancing the stoker, is that it will enable us to employ young men as firemen with a greater degree of intelligence than we can do to-day. It was almost beyond human endurance for a fireman to work on a locomotive, particularly a freight locomotive, and maintain the maximum pressure on a division of 150 miles. The object of all railways at the present time is to build locomotives with the greatest capacity possible, and in order to get good efficiency from these locomotives I believe we must have a mechanical stoker. We are going to have men in the future for firemen that will give us engineers such as we should have. We must lessen the burden of the fireman. I certainly believe that the time is not far distant when all roads, particularly trunk lines, where they have to haul heavy tonnage will be obliged to equip their locomotives with stokers in order to get full efficiency from them.

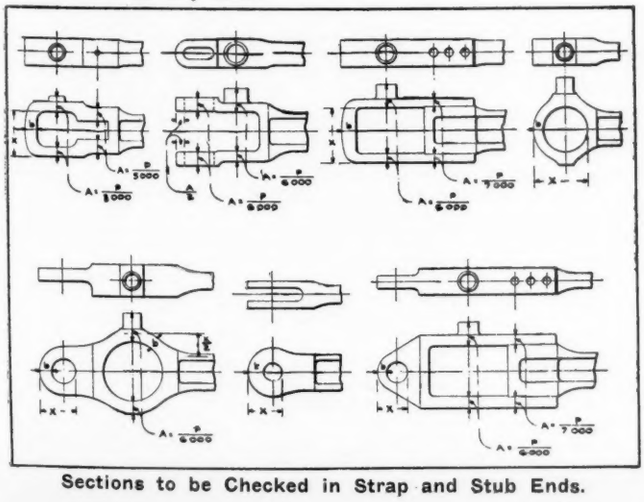
Thos. Roope (C. B. & Q.): I think perhaps we ought to go slow in considering the remarks of the speakers who have just spoken. I doubt if there has yet been a stoker made, with which there could not be found some fault. We have tested the underfeed and the overfeed stoker, and some parts of the reports state that the feed has been very accurate. That I can agree with from observation, but it has not been our experience that you use less coal with a stoker than you do without one. Then again there is no stoker but which has a great number of parts to maintain. That is one thing that we are all trying to keep away from; we want to make our locomotives as substantial as we can, and to avoid delay from break-downs. Some of the stokers are complete in one respect, and it is difficult to figure they are all right otherwise.

W. J. Tollerton (C. R. I. & P.): The question of oil burning on a locomotive versus coal burning will be one which will be soon settled, because of the rapidity with which oil is going out of use, due to the fact that the price has been raised, prohibiting its use as a fuel for locomotives. We have been able to get very much increased service out of a locomotive using oil instead of coal, probably 12 to 15 per cent.—both in carrying capacity and in service on the road. The question, however, of fuel and stokers, I think should receive a great deal of consideration, for the reason, as above stated, that oil, unless the roads own their own wells, will not very long be a factor in fuel.

There was no report on the Revision of Standards and the committee on specifications for cast-steel locomotive frames requested more time which was granted. Wm. Forsyth (*Railway Age Gazette*) suggested that the latter committee request the American Society for Testing Materials to prepare a special specification for a locomotive frame.

MAIN AND SIDE RODS.

One year ago a progress report was submitted, and the members were requested to send in criticisms and suggestions. The committee have received no criticisms or suggestions for changes, and, therefore, must assume that the members are satisfied with the formulæ as they stand.



Sections to be Checked in Strap and Stub Ends.

CHECKING FORMULAE.

All measurements are given in inches and pounds.
A = Area of section considered.
a = Width of section considered.
b = Depth of section considered.
C_1 = Max. compression unit stress for transverse bending.
C_2 = Max. compression unit stress for vertical bending.
c = $c_1 - c_2$ = Coefficients.
d = Cylinder diameter.
L = Length of rod from centre to centre of pins.
M = Bending moment.
P = Max. compression strain acting at end of rod.
p = Max. boiler pressure.
Q = Cylinder pressure = 0.7854 d^2 p.
R = Radius of driving wheels.
r = Radius of crank.
RG = Radius of gyration of section—axis horizontal.
rg = Radius of gyration of section—axis vertical.
S = Stress—and where used in formulæ must not exceed one sixth of ultimate strength of the steel.
s = Amount of horizontal offset in rod.
SM = Section modulus of section considered—axis horizontal.
sm = Section modulus of section considered—axis vertical.
W = Weight on pairs of drivers actuated through rod considered.
Main rod area must not be less than P ÷ 10,000 lbs.
For main rods $P = Q$.
For side rods $P = \frac{0.3\ WR}{r}$

To determine C_1 and C_2, calculations should be based on a section half way between rod pins.

For transverse bending in rods having knuckle pins flexible transversely

$$C_1 = \frac{\frac{P}{A}}{1 - \frac{P\,L^2}{675\,000\,000\ A\ rg^2}}$$

For all other rods

$$C_1 = \frac{\frac{P}{A}}{1 - \frac{P\,L^2}{1\,200\,000\,000\ A\ rg^2}}$$

For vertical bending in all rods

$$C_2 = \frac{\frac{P}{A}}{1 - \frac{P\,L^2}{300\,000\,000\ A\ RG^2}}$$

Values for C_1 and C_2 can also be taken from tables in "Kent's Pocket Book" under heading "Merriman's Rational Formula for Columns."

First—For rods without offset the larger value of C_1 and C_2 should be taken equal to S.

For rods with offset the larger value of $C_1 + \frac{Ps}{sm}$ and C_2 should be taken equal to S.

Second—$S = C\ \frac{AL^2 r}{SM} + C_1 P \left(\frac{1}{A} + \frac{5}{sm}\right)$

The calculations should be based on a section located at a distance 0.6 L from crosshead pin for main rods and halfway between pins for side rods.

VALUES OF C AND C_1.

Rev. per min.		256	325	375	420
Main rod	c =	0.036	0.055	0.073	0.091
	c_1 =	0.500	0.500	0.400	0.300
Side rod	c =	0.071	0.106	0.142	0.177
	c_1 =	0.500	0.500	0.500	0.500

The co-efficients selected should correspond with the highest number of revolutions per minute which the locomotive can make.

If this cannot be determined, use
420 r.p.m. for high speed passenger locomotives.
375 r.p.m. for passenger and high speed freight locomotives.
325 r.p.m. for all other locomotives.

Very simple rules for rods, without offset, and having bodies with rectangular section, based on the above theory, follow.

First—Stress is less than one-sixth of ultimate strength of the steel if "L" is less than 46 "a" or 23 "b" and if "A" is more than "P" divided by one-eighth of ultimate strength of the steel.

Second—$S = c_2 \frac{L^2 r}{b} + C_1 \frac{P}{A}$

VALUES OF C_1 AND C_2.

Rev. per min.		265	325	375	420
Main rod	c_2 =	0.22	0.33	0.44	0.55
	c_1 =	0.50	0.50	0.40	0.30
Side rod	c_1 =	0.43	0.64	0.85	1.06
	c_2 =	0.50	0.50	0.50	0.59

The allowable stresses for the various sections of rod ends are given in connection with the diagrams following, except where thickness of section is indicated by the letter "b." The figures denote maximum stress allowed under end load "P." If the minimum areas of the two members differ, take double the lesser area for "A."

The minimum area at points indicated by letter "b" should be—

$$\text{For main rods—}A = \frac{PX}{30\,000\ b}$$

$$\text{For side rods—}A = \frac{PX}{60\,000\ b}$$

In which "x" is the average diameter of eye or average spread of jaw members.

The above checking formulæ is therefore submitted as recommended practice.

The report is signed by:—W. F. Kiesel, Jr.(Penna., chairman; H. Bartlett (B. & M.); G. Lanza (Bald. Loco. Wks.); H. B. Hunt (Am. Loco. Co.) and W. E. Dunham (C. & N. W.).

DISCUSSION.

O. C. Cromwell (B. & O.): We have some advantage in increasing the fillets joining the sections to the stub, making a very much larger radius. That does not appear to be covered in this report.

W. F. Kiesel, Jr. (Penna): The question of the connection between stubs and rods has not been specially considered. It is generally conceded that it is necessary to make a transition from the body of the rod to the stub gradually, so as not to contemplate deflections at that point.

C. A. Seley (C. R. I. & P.): There are a great many questions in connection with the design of these parts of locomotives. I have had some experience on one class of engines, with rods. It has not been a very satisfactory performance, and identical rods of another class have failed; being a different lot they possibly were affected by a different chemical composition. There are a number of elements entering into the matter beyond the one which is explained. In the short time I have had this paper I have found it difficult to intelligently discuss it. I therefore move that the paper lay over for a year for consideration, and be brought up then for the adoption of a standard, inasmuch as we do not have a recommended practice in the association.

The motion was carried.

SAFETY VALVES.

(*1*) The committee on safety valves herewith submits the following report: The suggestions given below apply to oil and coal burning locomotives, whether using superheated or saturated steam. Safety valves suitable for the requirements of coal-burning locomotives should be ample for those burning oil, inasmuch as the enginemen have control of the fire of an oil-burning locomotive to a greater extent than on coal burners.

(*2*) *Formula for the Size of Valves.*—In view of the variation in the various makes of safety valves as regards lift, any formula for the size of valve should take this item into consideration. No change should be made in the formula proposed by the committee of this Association in 1910, except that the lift and diameter of the valve will be substituted for the area. The following formula is therefore suggested:—

ASSUMING VALVES HAVE 45-DEG. SEAT.

D — The total of the actual diameters of the inner edge of the seats of valves required.
H — Total heating surface of boiler in sq. ft. (Superheating surface not to be included.)
L — Vertical lift of valve in inches.
P — Absolute boiler pressure in lbs. per sq. in.

$$D = .036 \times \frac{H}{L \times P}$$

EXAMPLE.

$$\frac{.036 \times 2878}{.1 \times 200} = 5.2 \text{ in. Diameter}$$

which would require two 3-in. valves.

(*3*) *Maximum Capacity of Safety Valves.*—The only accurate method of determining the capacity of safety valves is by actual test in a testing plant, with safety valves fully equipped with springs, as in actual road service. In order that it should be positively known that safety valves will prevent undue raise in pressure under extreme conditions, they should be subjected to a road test.

(*4*) *Number and Size to be Applied.*—Every locomotive should be equipped with not less than two, and not more than three safety valves, the size to be determined as per formula in paragraph 2. Safety valves to be set as follows:

First—Boiler pressure.
Second—Two lbs. in excess.
Third—Three lbs above second, or five lbs in excess of first.

(*5*) *Metal for Valves and Valve Seats.*—No metal has yet been developed as entirely proof against erosion. Nickel seats and valves are desirable, and an improvement over other metal, but are expensive as to first cost and renewals; therefore, the committee's recommendation is to continue the use of bronze alloys.

(*6*) *Stamping Lift on Valves.*—Manufacturers should be required to stamp on the valve the lift in inches, as determined by actual test, with valve in working condition, and set for a blow-back of not to exceed 3 lbs. The committee recognizes the fundamental importance of valve lift. It, therefore, recommends that in design and manufacture valve lift receive proper consideration.

(*7*) *Estimating Steam Discharge.*—Steam discharge from safety valves of given size can be estimated closely by the use of Napier's rule for flow of steam, as follows:

Flow of steam per second:
Absolute pressure in lbs. per sq. in., multiplied by area in sq. in. of discharge opening, divided by 70.
Multiplied by 3,600 gives flow in lbs. per hour.

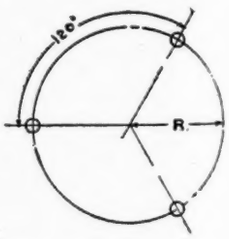
(*8*) *Location of Valves on Boilers.*—The location of safety valves has much to do with the normal crest of the water in the boiler; therefore, safety valves should be located at the highest point on the boiler, where clearance limits will permit, in vertical position, avoiding the use of piping, long nipples and ells between safety valves and boiler.

(*9*) *Spacing in Dome.*—Where safety valves are located on an independent dome, they should be spaced as per Fig. 1. The opening from boiler into dome and the area between supporting ribs in dome should not be less than inlet area of valves. If this

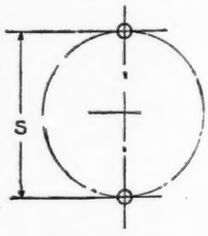
W. J. TOLLERTON,
Chairman, Committee on Safety Valves.

VALVE SIZE	SPACING S	RADIUS R
4½"	9"	5 3/16"
4"	8½"	4 7/8"
3½"	8"	4 5/8"
3"	7¼"	4 3/16"
2½"	6½"	3¾"

APPLICATIONS MADE AS DESCRIBED PERMIT USE OF WRENCH FITS RECOMENDED & MOVEMENT OF STANDARD WRENCH ONE SIXTH OF A TURN WITH A REASONABLE MARGIN



THREE VALVES



TWO VALVES

Fig. 1—Location of Safety Valves.

is not done, the opening will momentarily reduce pressure, causing valve to flutter and hammer.

(*10*) *Hydrostatic and Other Tests.*—The practice of screwing down the safety valve spring during a hydrostatic test of boiler should be discontinued. Valves with springs designed for certain pressures should not be subjected to extreme pressures. One safety valve should be removed and replaced with a special high-pressure valve, and the other valves should be removed and replaced with caps or plugs during test.

(*11*) *Standard Connections.*—In order to make valves of different manufacture interchangeable, recommend standard thread and diameter of valves at connections as follows:

2½-in. valve	2½-in. U. S. S. pipe thread	8 thds. to in.
3 -in. valve	3 -in. U. S. S. pipe thread	8 thds. to in.
3½-in. valve	3½-in. U. S. S. pipe thread	8 thds. to in.
4 -in. valve	4 -in. U. S. S. pipe thread	8 thds. to in.
4½-in. valve	4½-in. U. S. S. pipe thread	8 thds. to in.

Valves of above sizes to be made for U. S. S. wrench fit.

(*12*) *Inspection of Old Springs.*—As it has been found that the condition of the safety valve springs greatly affects the discharge capacity of the valve, old springs should be tested as to their deflection under load before being used in required valves.

(*13*) *Repairs to Safety Valves.*—Safety valves should be thoroughly overhauled and put in good condition whenever the locomotive is in shop for general repairs. Standard gages should be used in order that important dimensions may be maintained as originally designed. If this is not done, it generally impairs the efficiency of the valves. The committee desire to thank the various manufacturers and members for the assistance rendered.

The report is signed by:—W. J. Tollerton (C. R. I. & P.), chairman; I. B. Thomas (Penna.); W. D. Robb (G. T.) and E. C. Schmidt (Uni. of Ill.).

DISCUSSION.

M. Flannagan (C. & O.): I notice that the committee in this paper recommend that the valves be threaded for pipe tap connection. I assume that it is the intention of the committee that it shall not be necessary to screw them down to a shoulder, in making this fit. It has been my experience sometimes with certain valves, where the seat is close to the threaded portion that the valve would be distorted by some injudicious workman screwing it on too tightly. Personally, I believe we can get better service with a straight thread, and the valve to be screwed down to a shoulder.

Mr. Tollerton: I will say this in regard to the valve connection: the committee investigated the matter, and was surprised to learn there were practically no 2 manufacturers who turned out a standard connection; that is, the threads and diameters used had no standard taps to suit. In deciding on this standard connection, we used the U. S. standard pipe tap. Of course, I presume that the manufacturers in future will make any special shank that is desired by the railway, and our aim was to get a wrench fit of suitable diameter, a standard by which wrenches could be purchased, and to have all valves made of a given diameter, the same size as for the wrench fit.

In investigating the matter the committee found that open pipes and muffled pipes did not have the same wrench fit, so it was necessary for a workman, who was going on top of a locomotive, and having two valves to remove, to carry two wrenches. As far as the straight thread versus the pipe tap screwed to a shoulder is concerned, the latter method may have some advantages, but it has many disadvantages, such as the likelihood of stretching the valve, reducing it, and hammering it makes the application of the nipple necessary each time you unscrew it.

C. D. Young (Penna. Lines West): I did not expect to discuss this paper this morning, and so did not bring with me the notes which I had prepared on the subject of safety valves, but I will endeavor to bring out some of the points which were brought out after I received this report. In paragraph 4, it is recommended that "not more than 3 safety valves" be used. We have made a large number of experiments on safety valves which follow practically the formula given in paragraph 2, and we have never found a condition yet on a boiler where 3 safety valves were needed. I believe that at the present time it is a mistake for the association to recommend 3 safety valves, for the third one is not needed on any of the largest boilers which are built. If the safety valve is designed in accordance with the formula proposed, I do not feel it will ever be necessary to have 3 safety valves in order to properly assure holding the pressure.

If the committee and the association desire 3 valves, I would suggest a change in the setting of the second valve, from 2 lbs. to 3 lbs. It is very difficult to keep 2 safety valves within 2 lbs. of each other, and I believe we will fully answer all the requirements for keeping the second safety valve in operation by a range of 3 lb. pressure between the nominal working pressure and the next pop. If the recommendations of the committee are to be adopted, to have three valves, I would like to see the second valve set at 3 lb. and the third one set at 5 lb.

The committee in paragraph 5 states that "Nickel seats and valves" (and I presume that the entire body of the valve would be included) "are desirable, and an improvement over other metal, but are expensive as to first cost and renewals." I would like to ask the committee for more information on this subject. It is stated here pretty broadly, that the only reason we should not use nickel seats and valves is because they are more expensive in first costs and renewals. Now, if the nickel valve is the right thing, I believe that many more roads would be using them than are doing so at the present time. I will ask the committee, what percentage of the roads which answered the circular, stated they were using as standard on their locomotive, nickel valves and seats? Before approving this recommendation, I would like to receive some information indicating whether or not we would be justified in going to a nickel valve. I do not believe there are many used. Most of the manufacturers are not bringing them around and talking them up, at least those who have had long experience with them.

In paragraph 11, the committee suggests that the U. S. thread be used, with which I agree, but I would suggest inserting in the paragraph after the word "recommend," the words "where valves are threaded." It is necessary on some of the very high boilers to abandon the use of the threaded valve and use a ground ring joint with studs, and I believe we should recognize that is proper construction; and by so modifying this paragraph, it permits the designer to use the ring type of joint with studs and nuts.

Mr. Tollerton: In answer to Mr. Young's question about the nickel seat, I will say that our investigation showed that very few are being used; you will note by reading further on in paragraph 5, that we do not recommend them, but in our investigation as to use of valves, we found there were some nickel seats. The principal difficulty with them is the insertion of the nickel seat in the brass body of the valve. We felt that the average locomotive machinist could not do it successfully, and by adopting the nickel seat we would only have another leak in the pop valve.

As to the question whether we shall have 2 or 3 valves, our investigation developed that there were a great many lines using 3 valves, and they were just as strong for the 3 valves as the other lines were for the 2 valves. We, of course, wanted to make the report broad enough to suit all of the railways. That is the reason we felt there was no reason for making any further recommendation. The variation between the first and third valve is so great now, that practically the third valve will not work at any time, so that we wanted to make the report broad enough, to enable a road to use 2 or 3 valves as it desired. The report does not state that 3 valves are required or needed, but it gives any road the privilege of using 2 or more valves.

Wm. Elmer (Penna. Lines): While it is true that the enginemen have control of the oil fires to a better extent than they do on a coal-burning locomotive where the exhaust causes a very intense combustion, in case of any derangement of the parts or inability of the enginemen to control the oil fires, is it proper to assume that no more than the ordinary provision which is made for the coal-burning locomotive is necessary?

J. F. DeVoy (C. M. & St. P.): It is altogether probable that in any ordinary practice one locomotive pop valve of sufficient size will take care of any steam generated by a boiler, so that it would seem probable that 2 valves were the proper thing, but there has always been a doubt in my mind as to just what defense you could make, in case of a suit at law, based on the explosion of a boiler which had 2 valves. We will assume that there is a possibility of the first valve becoming inoperative through some means. Then the question arises as to whether the second valve, in say, an oil burning locomotive will properly take care of all the steam generated at a quick shut-off of the engine.

In order to properly guard against anything which might be brought up in a case at law, I believe there can be no question raised but what the third valve will take care of any contingency whatever, and the road with which I am connected has always favored the third valve on that account, not because of a probability that it will be called into play, but to absolutely guard against any contingencies which may possibly arise.

In a boiler explosion of any kind, it has been quite definitely determined that it takes from 14 to 20 minutes to lose the water in a boiler where the gage cocks have shown one or two gages of water, a variation of 2 or 3 in., or down to the point where the rupture or explosion takes place, say anywhere from 9 to 14 in. below the top of the crown sheet. Of course, we all realize that there

is only one thing that will cause a boiler explosion, or to cause the crown sheet to drop, or whatever way you want to put it, and that is the loss of water. There has been a doubt in my mind as to whether the additional 2 valves might not give a man in charge of the boiler a minute or two longer in which to save his life, because if he acts at the right time, there is a possibility that he can prevent something occurring. However, I still believe that the report of the committee is about right in allowing a road to use 2 valves if by doing so, it thinks it is properly protecting itself. But in the case of a larger boiler, generating steam much faster, I think it would be just as well to risk the extra $20 and then you know you have done everything it is possible for you do do to protect the men operating the locomotive.

Mr. Tollerton: None of the lines like the Southern Pacific and the Santa Fe, which are large users of oil burners, had in any way changed their number of pop valves as between oil and coal burning engines. On the Rock Island we have a number of oil burning engines, and use the same installation on oil burners as on coal burners.

Referring to paragraph 9, and the chart accompanying it, probably a word of explanation might be due there. We found in making inquiries and investigation, that it is quite frequently the practice to crowd the safety valve into too small an era. We thought it might be desirable to get up a sketch, such as is shown in connection with paragraph 9, which would give the minimum allowance between the valves, and permit the swing of a wrench to tighten or loosen the valves. That is the idea of that sketch.

Mr. DeVoy: I move that the report be accepted and referred to letter ballot, the rejort just as it is.

T. R. Cook (Penna. Lines): Before that motion is put, there is just one point concerning which I should like to hear further from the committee, and that is paragraph 6, which says "Manufacturers should be required to stamp on the valve the lift in inches as determined by actual test." This I assume, the committee put in, with the understanding that the lift of the valve determines the capacity of the valve. That was not my understanding. I believe there is a considerable difference in the discharge of valves with the same diameter in lift, depending on the design of the valve, both as to the steam passage and as to the contour of the lifting lip, and if any stamping on the valve should be done it should be in pounds of steam per hour, rather than the dimensions of the valves.

Mr. Tollerton: The idea of asking the manufacturers to stamp the lift on the valve was that it might be readily determined, by the formula, as to the valve requirements for a certain size boiler. It has not anything whatever to do with the discharge of the valve, merely indicates the lift, 1/10 or 1/8, or whatever the amount should be, so that anybody can figure out the safety valves required for a given boiler.

O. C. Cromwell (B. & O.): Referring to paragraph 11, if we want to maintain the standard, we should have standard thread gages for that fit. We find that is necessary, and we furnish the gages to the manufacturer. We have not a very large range. We want a locomotive to take care of your clearances when you are applying safety valves, so in order to keep within the very closest range it is necessary to keep your range up to very close dimensions; therefore we use both a male and a female gage, using the male gage for the safety valve and the other for the stud that is used in connection with it. I should think that should be incorporated in the master mechanics' revised dimensions for these threads.

As regards the sizes made for the wrench fit, the report says: "Valves of above size to be made for U. S. S. wrench fit." I do not know how much larger that is going to be over the present size dimensions generally used. It occurred to me it would be somewhat larger. Our locomotives are very much crowded and the safety valves are in a cramped condition, and if we enlarge the wrench fit over what it is at present, you will have trouble in applying the valve.

Mr. Tollerton: The committee took that up with all the pop valve manufacturers, and wrote them what we proposed to recommend as to the standard connection and standard wrench fit. They all agreed to it and said they were very glad to see the move made. I know cases where this wrench fit exceeded the diameter of the outside of muffle, so that any valve that will come in on any dome or turret, the wrench fit will clear.

As regards the increased size, very little is added to the present manufacturers' wrench size fit, to bring it up to the U. S. standard size. I have got the sizes here, and will be glad to read them, as far as we were able to determine, but the increase is from 1/8 in. to 3/8 in. over the bolts, not more than 1/16 to 3/16 on each side, and in no case did any of the large manufacturers complain about the increase in metal. With the sketches as shown, as I said before, the wrench fit will clear the diameter of the muffle.

C. D. Young (Penna. Lines): I want to refer to the point brought up by Mr. Cook who spoke about the lift of the valves. Mr. Nelson, the engineer of tests, did a great deal of work on the subject of studying the lift of pop valves, and after a number of years of effort, he came to the conclusion, that so far as he was concerned, and the department was concerned, it was impossible to determine accurately the lift of the valve when working. I believe that view of the matter has been confirmed by the Massachusetts Institute of Technology, where they have been doing some work along the same line.

I therefore think that in view of this fact, I think it would be well to change the stamping of the lift, and I would propose the capacity, or some other measure of the valve, as to its size; either by number or capacity in steam be stamped. You can measure the capacity of the valve, and that, it seems to me, is the better measure than the lift of the valve, although I feel that some tolerance in lift should be provided for, so that the manufacturer will not be permitted to say 0.15 lift, or greater, or some other such figure. It seems to me it would be desirable to let this report go back to the committee, in view of the discussion we have had, for further consideration of the subject, and for report next year, and I would make an amendment to the motion of Mr. Devoy to that effect.

Mr. Seley: This is a report which has been before our convention for two years. As I recall it, the formula for the discharge is practically the same as was gotten out by the committee in its report a year ago. Nowithstanding what has been said about the impossibility of measuring the lift, I believe, within broad lines, at least, the lift can be expressed as a comparative measure to discharge the valve. Certain manufacturers in the last few years have brought out a higher lift valve, for instance, than has been the custom in the older designs. Whether these new designs have proven to possess all the merits claimed for them by the manufacturers, I do not care to discuss, I do not know; but in any event, the broad field between the high lift and the old lift is sufficient, I think, to carry out what the committee have in mind, and the manufacturers who were consulted on this matter, as I understand it, comprise all of the important ones, and as the matter contained in the report has their approval, I would say that it seems consistent to carry out the recommendation of the committee. I would therefore second Mr. DeVoy's motion without the amendment.

T. Rumney (C. R. I. & P.): Would it not be possible to add to the life of the valve in inches, as recommended by the committee, the discharge of the valve, and that would cover Mr. Young's point, and also take care of the committee's recommendation. To me it would seem too bad to lay the report over another year after the committee has had it under consideration for two years.

Mr DeVoy: I do not know of any other way to measure the discharge of a valve except by measuring the annular opening of the lift of that valve. I understand Mr. Young's point perfectly; it was all right; but you must know the life of the valve before you can know the discharge. The lift of the valve must properly take care of the discharge, or you cannot in any manner figure the discharge of the valve, and so far as I have any knowledge, the discharge of the valve is properly taken care of by the lift, and cannot be taken care of in any other way. Mr. Young shakes his head; but I know, so far as I am concerned, that it does take care of the discharge of the valve, and if you will refer back to your mathematics, you will find out that is the proper way to do it.

Mr. Tollerton: We tried in making up this report to get the last word on the safety valve question. I quite agree with the suggestion of Mr. Rumney in regard to the discharge, and I think the committee will, but it is of vital importance that the lift be stamped on the valves. Valves of the same diameter with different lifts will have different discharges. We have tried it and we know it, and therefore the lift increases in importance. I personally cannot see any objection to it. It should be on the valve. If you want anything else on the valve for further information the committee will be pleased to make a recommendation to that effect.

Mr. Young: If the committee will accept Mr. Rumney's suggestion and the suggestion I offered on paragraph 5, striking out the reference to nickel seats and valves, I will withdraw my amendment to Mr. DeVoy's motion.

Mr. Tollerton: As a matter of harmony the committee has no objection to accepting it, but I think paragraph 5 should not be taken out for the reason that it will show in the proceedings that the question of nickel seats has been looked into. We could not find where nickel seats were recommended by any manufacturers or were in use

on any number of railways, but we might start some investigations later in that direction.

Mr. Young: I want to read what the committee said in that connection: "Nickel seats and valves are desirable and an improvement over other metal but are expensive as to first costs and renewals." What does that mean? It means, inferentially that the committee would recommend these nickel seats and valves, but that they are too expensive as to first costs and renewals.

Mr. Tollerton: Read the last portion of the paragraph where we recommend the use of bronze alloys.

Mr. Young: You make the broad statement that nickel seats and valves are desirable and an improvement over other metal, but the reason you do not recommend them is because they are expensive as to first cost and renewals. That is a broad statement, to say that nickel seats and valves are desirable, and do not recommend them because they are expensive, and then recommend something cheaper. I do not think we know enough about nickel seats and valves to pass any opinion upon them, no one, to my mind, is using them successfully, and I should think that statement should be carried out.

Mr. Seley: I think that the object of the committee in putting this into the report, as the chairman of the committee has said, is to indicate that the whole matter has been considered. The matter of objection to nickel seats has been fully covered in the discussion. Anyone who receives a copy of our proceedings, and is interested in this subject, as a natural supposition, reads the discussion as well as the paper, and I think we would limit rather than broaden the question if we excluded information as given to us by the committee and as developed in discussion.

Mr. Rumney: The paragraph might be changed to read as follows: "Nickel seats and valves, although providing an improved lift, are undesirable because of first cost, cost of repairs, and the difficulty of their application; therefore the recommendation of your committee is to continue the use of bronze alloys." Would that meet your ideas, Mr. Young?

Mr. Young: I would second such a change, if the committee will accept it.

The Vice-President: Will Mr. Tollerton accept that change in the report?

Mr. Tollerton: Yes.

With that amendment, Mr. DeVoy's motion was passed.

A CORRECTION.

An error was made in the article entitled "The Chilled Iron Car Wheel," published in the first issue of *The Daily*. It was stated that if the cost of a 625-lb. wheel were based on an average life of 12 years this would make the cost of the wheels under a car approximately $2.33 per day. The statement should have been that this would be approximately the cost per year.

M. M. HONORARY MEMBERSHIPS.

During the convention yesterday the following members, whose applications had been approved by the executive committee, were elected honorary members of the M. M. Association: George E. Branch (member since 1894); H. Tandy (member since 1883); J. S. Turner (member since 1887); Thomas Walsh (member since 1874); Charles A. Thompson (member since 1890); W. A. Brown (member since 1891).

FIRE ON THE PIER.

The services of the pier firemen was called into play Saturday morning in the power plant at the entrance to Machinery Hall. On starting up the air compressor, the motor driving it demanded more current than the primary circuit could carry. This overheated the main fuse which refused to blow. As a result, a few sparks flew and the smell of burning insulation brought a fireman with his extinguisher. Needless to say, however, his efforts were fruitless until the attending electrician came to the rescue by pulling the switches. A repetition of the fireworks has been guarded against by W. W. Paxson, the chief electrician of the pier, who has had oil switches installed.

HISTORY OF THE BARNEY & SMITH CAR COMPANY.

The growth of large manufacturing industries is always an inspiring study, especially those which were pioneers in their districts. The Barney & Smith Car Company, of Dayton, Ohio, was established in 1849 when Dayton was a town with 10,000 inhabitants and had no railway connection. The history of the company, which has recently been published, well illustrates the results that follow the honest and conscientious work of a few strong, able men building on a firm foundation. When the works were established by Eliam E. Barney and Ebenezer Thresher, the product was loaded on canal coats and taken down the Ohio River to the nearest rail connection. Now, however, Dayton is a city of 125,000 people, and has numerous steam and electric railway connections. The book is given up quite largely to a personal history of the officers and accounts of the various reorganizations which marked the development of the company from a capital of $10,000 to $4,500,000.

A very impressive table is included that gives a list of the employees who have been continuously in the service of the company for over twenty years. This gives the names of 182 men, of which 41 have served over 40 years. In the latter part of the book is included a history of each department giving the names of the various foremen and their lengths of service.

SUPERHEATERS AND SWITCH ENGINES.

One of the most interesting developments in the progress of superheater locomotives during the past year has been the successful application of the superheater to switch engines. It had been quite generally considered that switch engines did not offer the best opportunity for obtaining the highest efficiency from the superheater. This was based on the conditions under which the switch engine operates. It only works steam a comparatively small percentage of the time that it is in service, and then only during short intervals. The actual experience with superheaters in switching service has shown that the resulting economies have been even greater than those obtained with road engines equipped wi h superheaters.

It is well known that saturated steam switch engines operating under ordinary conditions have a marked tendency to work water out of the exhaust and that they suffer heavy losses from cylinder condensation. These losses not infrequently attain the magnitude of from 40 per cent. to 45 per cent. of the total water evaporated and it is necessary to use extra coal to evaporate the additional water. The use of highly superheated steam in switching service has entirely eliminated these losses and effected a corresponding saving in coal and water.

Under ordinary switching service conditions, where saturated engines are employed, there is a considerable loss of time of the switching crew while the engine is taking supplies, particularly water. During this time the crew is standing idle. Inasmuch as it is not necessary to take water so frequently with the superheater engines in switching service this time is available for the purpose of doing actual work.

In addition, it has been found by experience that switch engines equipped with superheaters furnishing highly superheated steam operate with a remarkable reduction in smoke. This is of considerable importance, especially in passenger terminals in large cities where the smoke nuisance ordinances are strictly enforced. The fact that superheater switch engines do operate with a minimum of smoke is explained by the fact that the saving in water makes it possible to do the same work with a correspondingly less amount of coal. It is, therefore, not necessary to fire so heavily, and more attention may be given to the practice of the proper methods of firing.

Finally, the use of highly superheated steam in switching service produces a smarter engine, thus making it possible to

do the same amount of work in less time or considerably more work in the same time. It is often desirable, especially in connection with the present-day high-speed passenger service, to make switching movements at a very rapid rate and the increased flexibility of the superheater switch engine is a valuable adjunct.

A RECORD LOCOMOTIVE PERFORMANCE.

A single locomotive of the 2-8-2 type recently handled a train of 112 cars weighing 7,590 tons over a division with an 8-mile ruling grade of .2 per cent., at an average speed of 15½ miles per hour, running time. An average speed of 9½ miles per hour was recorded on the hill. This is the latest of the record performances of the trial Mikado type locomotive, built last year for the Chesapeake & Ohio by the American Locomotive Company. This locomotive was illustrated and described in the Feb. 2 issue of the RAILWAY AGE GAZETTE and the March issue of the *American Engineer*.

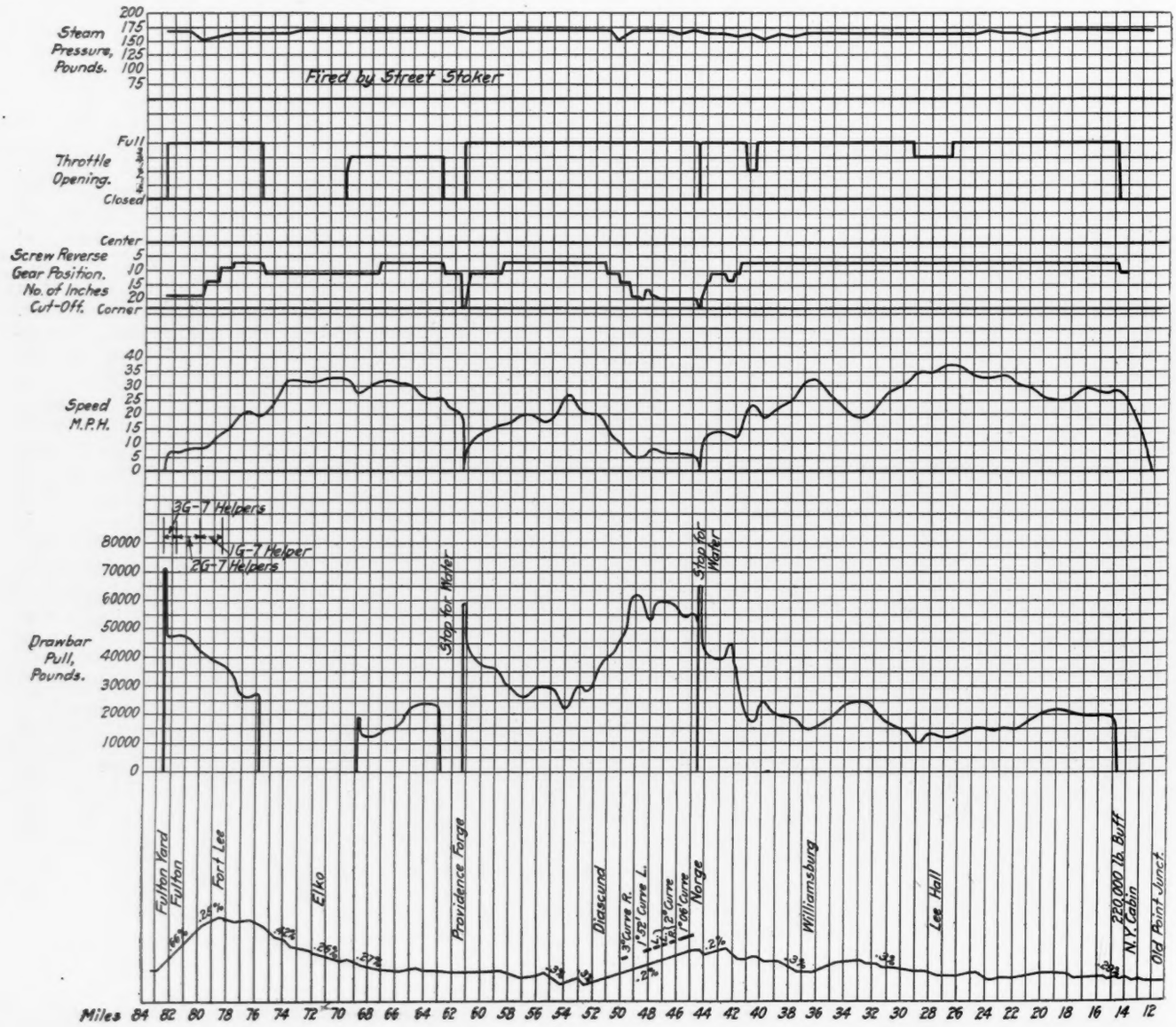
The above feat in itself, apart from the other circumstances of the run, is proof that this locomotive is the most powerful of its type. The real power of the locomotive, however, is possibly best shown by the remarkable hauling capacity developed by it at the higher speeds.

Exceptionally high drawbar pull, maintained mile after mile at speeds ranging from 25 to 30 miles per hour, are shown by the dynamometer record given herewith. A few typical consecutive records taken from the dynamometer charts of this and other runs in the series of tests are shown in the table below:

Mile Post.	Drawbar Pull (Pounds) Run No. 47.	Speed M. P. H.	Mile Post.	Drawbar Pull (Pounds) Run No. 53.	Speed M. P. H.
53½	25,000	28	54½	28,000	23
53	32,000	23	54	23,000	27
52½	27,000	24	53½	25,000	25
52	33,000	24	53	30,000	21
51½	36,000	20			

These figures have an important and very timely significance. They show the enormous power which can be obtained by careful design with a weight of approximately 60,000 lbs. per driving axle and in a type of locomotive well adapted to all around road freight service. This Mikado, weighing with its tender only 47 per cent. more than the Chesapeake & Ohio standard consolidation, can haul 77 per cent. more tonnage in 80.5 per cent. more cars at practically the same speeds. This striking fact is shown by comparison between the run cited above and the best record of the consolidation over the same division made in the same tests.

The record load for the consolidation was 4,246 tons. With this train, an average speed of 17 miles per hour running time over the division was made. The consolidation and tender with



Record of One Mikado Locomotive With a Train of 112 Car s, Weighing 7590 Tons.

full load of coal and water weigh 329,000 lbs., as compared with 484,700 lbs., the weight of the Mikado and its tender.

By reducing this comparison of the performance of the two classes of locomotives to terms of hauling capacity at the same speeds per pound of locomotive weight, the much higher efficiency of the Mikado is still better indicated. The consolidation hauled .0129 tons for every pound of its maximum weight including tender, and the Mikado, .0156 tons, or 21 per cent. more. The maximum record of this locomotive is 27,000 lbs. drawbar pull at 33 miles per hour. This is equivalent to a drawbar horsepower of 2,378 or one horsepower at the drawbar for every 132 lbs. weight of locomotive.

In the two runs, noted in the above table, the best record shown is 33,000 lbs. pull at 24 miles per hour made in run No. 47. This is equivalent to a drawbar horsepower of 2,110. This pull was developed at mile post 52, which is on a .2 per cent. grade. Consequently, by conservative estimate, the above horsepower at the drawbar means at least 2,385 I. H. P.

Run No. 47 also shows the highest sustained drawbar horsepower. Between mile post 53½ and 51½ the locomotive developed an average drawbar pull of 31,833 lbs., at an average speed of 23 miles per hour. This is equivalent to 1,901 drawbar horsepower.

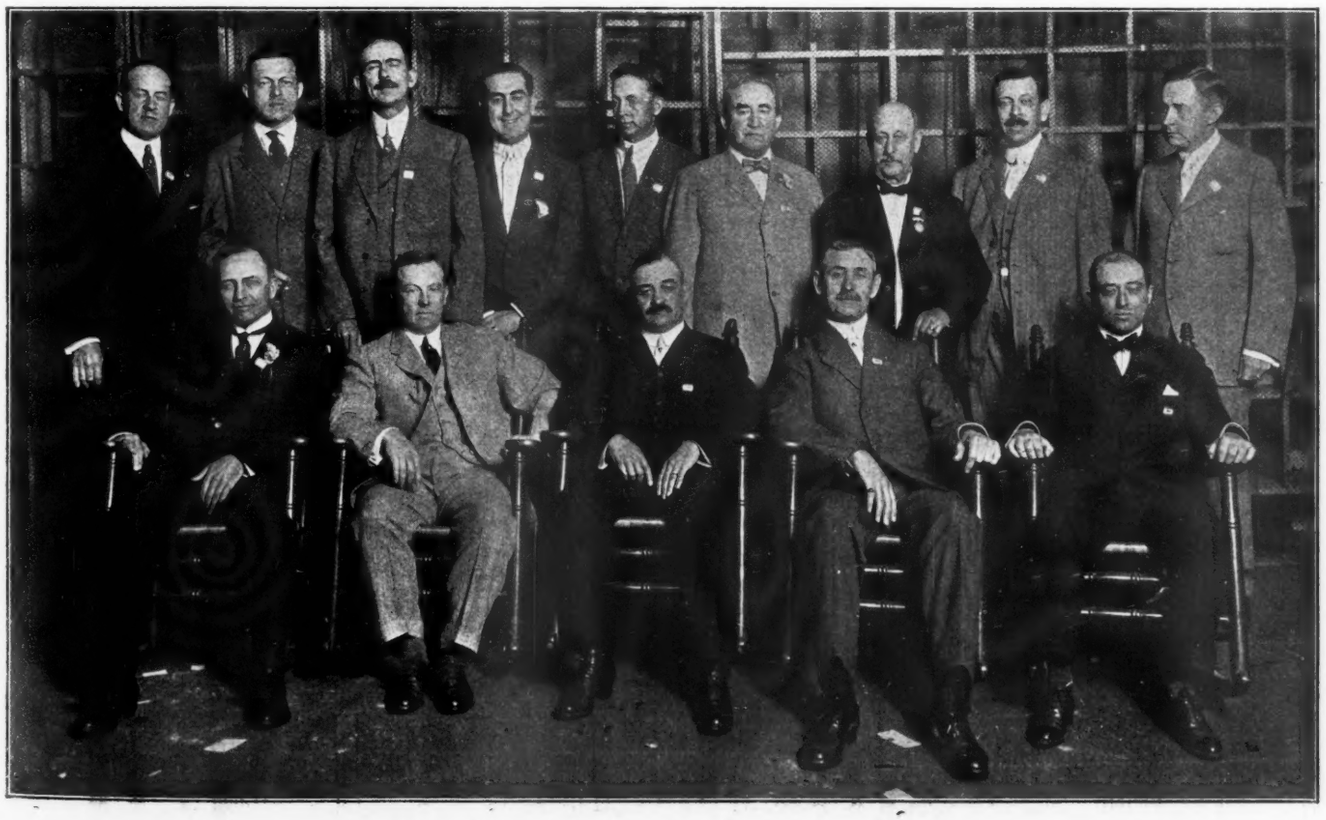
These figures, while interesting in themselves, have a particular significance. They show that in the big locomotive, carefully and properly designed, a greater percentage of increased power is secured for every percentage of increase in weight.

The full record of the run mentioned in the opening paragraph is given in the condensed dynamometer chart. This run was one of a series of tests which the Chesapeake & Ohio has been making to determine the maximum tonnage ratings for its various classes of locomotives. These tests were made with the Westinghouse Company's dynamometer car. On run No. 47, already referred to, the Mikado hauled a train of 102 cars weighing 7,045 tons. On the other runs, it hauled respectively a train of 98 cars of 6,767 tons aggregate weight and one of 100 cars of 6,905 tons.

It is interesting to note the performance of the Mikado with 7,590 tons on the 8-mile grade, at the top of which a stop was made for water. The average speed up the grade was 9.5 miles per hour, based on the speeds recorded at each half mile. For the last four miles, when the run developed into a steady drag, the locomotive developed a sustained drawbar pull of 57,750 lbs. at a practically uniform speed of 6½ miles per hour. Conservatively estimating the locomotive and tender resistance, this means that it maintained a tractive effort of 1,000 lbs. in excess of its maximum rated power based on 85 per cent. of the boiler pressure of 175 lbs. This indicates an unusually high mean effective pressure at maximum cut-off. It is undoubtedly attributable to the use of superheated steam, and in some degree, at least, to the more direct steam passages of the arrangement of outside steam pipes employed.

Starting this 7,590-ton train after taking water at the top of the .2 per cent. grade with the greater proportion of it on the grade is another record feat of the locomotive on this run. A drawbar pull in excess of the theoretical maximum tractive effort was developed at this point. It is particularly evident from the complete records that the locomotive has a large margin of capacity sufficient to maintain its full maximum rated power for protracted periods and to exceed this for short periods or at critical points.

Preliminary surveys have been completed for the railway from Bhamo, China, to Tengyueh, 123 miles. The gage will be either 2 ft. 6 in. or 3 ft. 1 in.



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McCauley, J. E., Shelburne.
McCool, Charles, Rec. Clerk, P. R. R. Pur. Agt., Shelburne.
McCraven, Jas. W., Asst. For., P. R. R., Pennhurst.
McManamy, Frank, Ass't Chief Insp. Loc. Boilers, V. S., Haddon Hall.
McQuillen, J. E., M. M., G. C. & S. F. Ry., Marlborough-Blenheim.
Mathes, S. R., M. M., Norfolk & Southern, Dennis.
Mercer, John T., Insp., B. & O., New Elwood.
Merryman, M., C. C. S. M. P., Western Maryland R. R., Brighton.

Mittenberger, J. C., Creson.
Montague, W. T., M. P. Supt., Penna., Chalfonte.
Morch, John, Mech. Draftsman, P. R. R., Somerset.
Morningstar, E. E., Draftsman, B. & O., Kennard.
Morton, R. C., Draftsman M. P. Dept., B. & O., Kenderton.
Moseley, W. S., Chief Draftsman, C. C. & O. Ry., Iroquois.
Mounce, R. S., Erie R. R., Schlitz.
Nelson, Ley B., Traymore.
Norris, W. B., Gen'l Foreman Altoona Mach. Shops, P. R. R., Dennis.
O'Meara, W. J., Gen. For., N. Y. N. H. & H., Haddon Hall.
Pattison, R. C., M. E., Wheeling & Lake Erie R. R., Strand.
Perrine, Harold, Pennhurst.
Peterson, F. W., M. M., C. & N. W., Pine Hall.
Pickard, F. C., M. M., Pere Marquette, Haddon Hall.
Rhett, E. M., Electrical Engineer, Center of Georgia Ry. Co., Marlborough-Blenheim.
Richards, J. T., Retired Engr., P. R. R.
Riegler, Fred, For., W. & L. E., Chalfonte.
Robinson, W. L., Engr., P. R. R.
Robinson, W. L., R. F. of E., B. & O., New Chatham.
Scatchard, H., Gen. St. Keeper, N. & W. Ry., Shelburne.
Scheck, H. G., Rd. For. of Engines, P. R. R., Jackson.
Schenck, Edwin, Asst M. M., P. R. R., Marlborough-Blenheim.
Schmoll, G. A., Supt. M. P., B. & O. R. R., Traymore.
Schomdorfer, F. C., Asst. For., B. & O., New Elwood.
Seddon, E., For., Lehigh Valley, Edison.
Shackford, J. M., D., L. & W., Marlborough-Blenheim.
Sheldon, R. D., Engine House For., P. B. & W. R. R.
Shipley, Wm. H., Gen. For. Blk Shop & Fdy., Western Maryland, 103 N. Maryland Ave.
Slayton, H. J., Engr., C. G. W., Arlington.
Slayton, H. J., C. C. W., Arlington.
Starritt, W. A., P. A., C. C. & O. Ry., Grand Atlantic.
Steele, Ben W., Gen. Mgr., A. & St. A. B. Ry., Chalfonte.
Stroner, Geo., M. I., Sunset Central.
Tapman, N. H., Insp. Test Dept., B. & O., Chalfonte.
Taylor, G. W., Marlborough-Blenheim.
Trego, J. G., Asst. Rd. For. Eng., P. R. R.
Tweed, H., For. Pipe Shops, P. R. R.
Van Gundy, C. P., Ch. Chemist, B. & O., Chalfonte.
Walter, L. J., Erecting For., C. R. R. of N. J., Jackson.
Werts, Jas. R., Car Insp., P. & R., Miller's Cottage
Wescott, E. A., Supt. Car Dept., Erie, Dennis.
Winterstein, John, Dist. Insp. Locos. Boilers, Interstate Commerce Commission, Arlington.
Witherspoon, W. H., For., C. R. R. Co. of N. J., Edison.
Woodbridge, H. C., Genl. Manager, Special Representative Buffalo, Rochester & Pittsburg Ry., Arlington.
Wright, H., Ex. of Patents, U. S. Gov., Marlborough-Blenheim.
Wrigley, A. M., Motive Power Draftsman, P. R. R., Chalfonte.

FOREIGN RAILWAY NOTES.

The French railway interests in Indo-China are reaching out in all directions for the development of their system. It has been announced in the press of the Far East that the Siamese government has definitely decided to build the connection between its own lines and the French lines into Saigon, as well as to the south, connecting with Singapore, Malay States, by means of a French loan. This, of course, means the further extension of China's railway connections through the Yunnan Railway. Owing to the fact that this French line to Yunnan ends in a sort of cul-de-sac, it has not been profitable, and a concession which will enable the French interests to open up additional country to feed their line is urgently asked.

The French interests in China have proposed a connection between the Yunnan line and Nanning to connect with the Wuchow-Nanning line. The Chinese authorities have so far refused a concession to foreign interests and are working on the proposition themselves. The board of communications through local authorities plans a line from Nanning to connect with the Yunnan line at Mengtsze. Surveys for this line are being made. The route will be about 400 miles long and reports seem to indicate that the proposed route is by Kaihwa and Kuangnan and thence down the river valley to Nanning. While the route presents no great difficulties, apparently, the road is likely to be expensive. No provision for the necessary capital has so far been made.

ROAD TESTS OF MALLET AND CONSOLIDATION LOCOMOTIVES.

The Carolina, Clinchfield & Ohio has had ten Mallet compound locomotives in service for about two years, and fifteen simple consolidated locomotives for about three years. Both of these types of locomotives were built by the Baldwin Locomotive Works. Road tests of the Mallets were made in October, 1910, and February, 1912. The consolidated locomotives were tested under practically the same conditions, in May, 1912. The average results of the tests and the principal dimensions of the two types of locomotives are given in the accompanying tables.

PRINCIPAL DIMENSIONS AND DATA OF LOCOMOTIVES TESTED.

Wheel arrangement	2-6-6-2	2-8-0
Weight on drivers, lbs.	325,850	178,650
Total weight of engine, lbs.	378,650	199,150
Total weight of engine & tender, lbs.	550,000	350,000
Diameter of cylinders	24 & 37	22
Stroke, in.	32	32
Steam pressure, lbs.	200	200
Diameter of driving wheels, in.	57	54
Tractive effort (M. E. P. = 85% boiler pressure), lbs.	77,400	49,000
Boiler diameter, 1st ring, in.	87	77
Tubes, number and size, in.	448-2¼	412-2
Tubes, length, ft. and in.	21.0	15.3
Grate area, sq. ft.	78	54
Heating surface, sq. ft.	5,752	3,482
Size of exhaust nozzle, in.	5¾	5½

The Mallet locomotives are equipped with Baldwin's reheaters in the smoke boxes. Both engines were hand fired and neither had a brick arch. The tests were conducted from Kingsport, Tenn., south to Soldier, a distance of 22 miles, on a continuous 0.50 grade, compensated for all curves, the compensation being such that tests with a dynamometer car have shown no increase in the train resistance due to the curves. These conditions make this section one of the very best on which to make comparative tests of locomotives, as the engines can be worked at their maximum capacity for the entire trip, and any number of readings and observations may be made under the same working conditions.

The coal used on all the tests was from the same mine, and the analyses, which are given herewith, show the quality to be the same. The coal was carefully weighed and sacked, and was dumped only as neded by the fireman.

	Oct., 1910	Feb., 1911	May, 1912
Moisture	1.04	1.00	1.10
Volatile matter	32.94	31.13	34.94
Fixed carbon	56.07	55.93	53.68
Ash	9.95	11.94	10.28
Sulphur	.81	1.14	.64
B. T. U.	13,830	13,743	13,736

The tank and boiler were carefully calibrated, and readings to determine the amount of water used were taken under the same conditions each time. It should be remembered, in comparing these tests with those of other roads, that in this case the engines were worked at their maximum capacity throughout the tests.

RESULTS OF TESTS.

Columns No. 1 and 2 are average of two trips.
Column No. 3 is the average of three trips.

	Col. No. 1.	Col. No. 2.	Col. No. 3.
Locomotive class	2-6-6-2	2-6-6-2	2-8-00
Date of tests	Oct., 1910	Feb., 1911	May, 1912
Grade, compensated for curvature	0.5%	0.5%	0.5%
Weather conditions	Fair	Good	Good
Condition of rail	Dry	Dry	Dry
Length of route, miles	17½	22	22
Time consumed, total	3 hrs. 6½ min.	2 hrs. 40 min.	2 hrs. 43 min.
Number of stops	2	2	2
Total time delayed at stops.	33½ min.	38 min.	27 min.
Actual running time	2 hrs. 33 min.	2 hrs. 2½ min.	2 hrs. 15 min.
Number of cars in train, including cab	67	51	35
Tons behind tender	4,437	3,513	2,402
Ton-miles of train load	77,386	77,297	52,851
Time throttle was open	2 hrs. 33 min.	2 hrs. 2½ min.	2 hrs. 15 min.
Average position of throttle.	Full	Full	Full
Total pounds coal burned	14,800	15,550	12,100
Total pounds water supplied boiler	101,629	95,090	87,388
Average indicated horse-power	1,472.2	.....	1,031

Average initial pressure in cyl.	H. P. 196		188
Average point of cut-off	H. P. .755		.56
Average revolutions per min.	45.5		66.2
Average boiler pressure, lbs.	198.4	195	196
Average speed, miles per hour	6.75	5,377	9.78
Maximum speed, miles per hour	9.95	10.8	46,550
Coal burned per hour, lbs.	5,825	99.5	12.95
Coal burned per sq. ft. grate area per hour	74.7	1.54	7,630
Coal burned per sq. ft. heating surface per hour	1.02	38,708	97.9
Water supplied boiler per hour, lbs.	39,867		1.32
Water supplied boiler per sq. ft. heating sur. per hr.	6.92	8.1	11.10
Coal burned per I. H. P. hour, lbs.	3.97		5.21
Water supplied boiler per I. H. P. hour, lbs.	27.1		37.7
Water evaporated per lb. coal	6.85	6.1	7.28
Equiv. evaporation from and at 212° per lb. of coal	8.36	7.52	8.82
Average temperature feed water	50.5°	43.5°	66°
Average temperature atmosphere	48°	38°	75°
Coal burned per 1,000 ton-miles of train load, lbs.	198	202	229
Water supplied boiler per 1,000 ton-miles of train load	1,350	1,230	1,653

It is interesting to note that while the tons behind the tender were 85 per cent. more for the Mallet, the coal burned per train mile was only 55 per cent. more, and in some of the individual trip the coal used was only 38 per cent. more for an increase of 82 per cent in the tons behind the tender for the same distance.

While these tests show in favor of the Mallet it is thought that the difference is not as great as it should be, on account of the Mallets having been in service only a comparatively short time when the tests were made. Also the men have become better educated in the handling of these engines, one result of which is that the engines are now run with a larger exhaust nozzle than formerly and burn less coal. This assumption is borne out by the fact that there has been a considerable reduction in the fuel consumption, for the same amount of freight handled, since the tests of the Mallet engines were made. It is intended to make another series of tests on the Mallets in the near future, which will not only give a comparison between the Mallets and the consolidation, but will also show the improvement in the service of the Mallets since they were received.

The Mallets have been used in road service since they were built, and it is largely due to this fact that the road has been able to show a very low operating ratio. Since these engines were built there have been considerable developments in the Mallets, especially in the application of superheaters and stokers, and it is very probable that future engines for heavy freight service on this road will be of this type, equipped with all latest improvements. The tests were conducted by W. S. Moseley, chief draftsman, under the general supervison of H. F. Staley, master mechanic.

The Prussian Landtag has under consideration a memorandum containing comprehensive proposals for electrifying and improving the Berlin city and suburban railways in order to render them capable of dealing with the increasing traffic. With this object in view it is proposed to set up two electric generating stations, one in a lignite district, probably near Bitterfield, and the other near Berlin, the latter as a reserve station, and to supplement the other during the heaviest periods of traffic. The work will involve the laying underground of six pairs of cables of 60,000v. tension. The total cost of the work, which will take about four and one half years to carry out, is put at $30,000,000, of which $12,000,000 is for right of way, construction work, etc., and the remainder for the provision and alteration of rolling stock. It will be necessary to provide 557 electric locomotives and 690 passenger coaches.

Conventionalities.

Langdon B. Valentine, of Valentine & Company, is attending the convention for the first time.

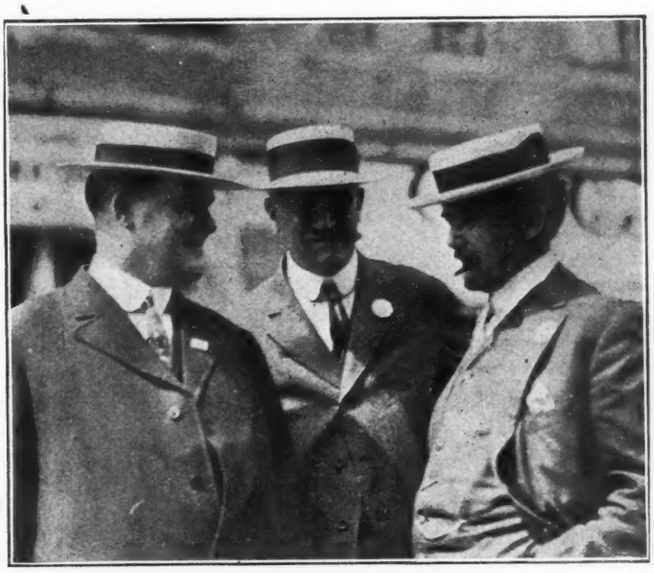
Joseph S. Ralston, president of the Ralston Steel Car Company, reached Atlantic City Friday and registered at the Chelsea.

F. W. Miller, president of the F. W. Miller Heating Company, is attending the M. M. convention and is stopping at the Dennis.

R. L. Mason was parading on the Boardwalk with a pick and shovel when the camera man caught him. Ask him for a copy of the result.

Blue Sundays may be disagreeable; but the best argument for them lies in the apparent ginger everyone possessed the following day.

J. W. Cyr, superintendent of motive power of the Chicago, Burlington & Quincy, took part in the opening proceedings of the M. M. convention Monday morning. Mr. Cyr is a guest of the Traymore.



PARKS TELLING A GOOD STORY.

Left to right—B. A. Keeler, Henry LaRue, Master Car Builder, C. R. I. & P.; O. J. Parks, General Car Inspector, Pennsylvania Lines.

C. A. Dunkelberg, treasurer of S. F. Bowser & Company, has just recovered from an attack of tonsilitis, induced by the spell of damp air of last week.

J. T. Carroll is again in attendance with added powers. He was appointed assistant general superintendent of motive power of the Baltimore & Ohio in February last.

Yesterday afternoon Chairman Ostby of the enrollment committee was presented with a 20-in. pigskin traveling bag and a folding cane by the members of his committee.

B. D. Lockwood, assistant chief engineer of the Pressed Steel Car Company, is here again this year. He was for several years mechanical engineer of the Big Four under Mr. Garstang.

Mr. and Mrs. Horace Baker, son and daughter, arrived from Cincinnati Sunday afternoon in Mr. Baker's private car. Mr. Baker is general manager of the Queen & Crescent and Alabama Great Southern.

The executive committee of the Railway Supply Manufacturers' Association will be glad to know that the "Information Bureau" has been buried at sea with appropriate ceremonies. *Requiescat in pace.*

M. J. McCarthy, assistant superintendent of motive power of the Big Four, is receiving the congratulations of his friends

L. C. Fritch.

on his improved appearance and the very successful result of an operation performed last winter.

Al. Burkhard, general foreman of the car department of the New York Central & Hudson River at West Albany, N. Y., is among the special guests at the convention. He arrived Saturday morning, accompanied by his 7-year-old son, Henry.

The Two Prossers—Tom and C. S.

Mr. and Mrs. J. W. Bettendorf are quartered at the Marlborough-Blenheim. They arrived from Davenport, Iowa, last week and were accompanied by Mr. Bettendorf's father and mother, Mr. and Mrs. M. Bettendorf.

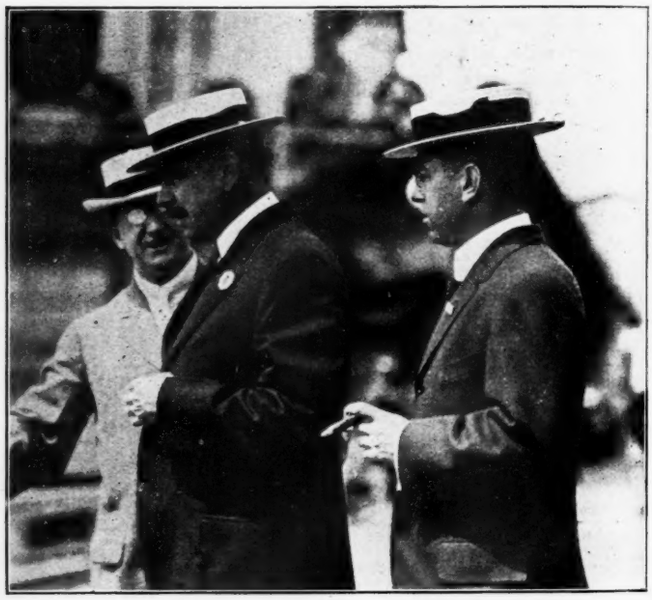
Charles D. Jenks, vice-president of Edwin S. Woods & Company, is registered at the Dennis. Mr. Jenks is accompanied by his bride, formerly Miss Marion Somers, of Chicago. The wedding took place in Chicago on June 4.

A. M. Darlow, mechanical engineer of the Buffalo & Susquehanna, who arrived on Sunday, occupies the unique position of being general storekeeper also. This responsibility has been placed upon him within the past few months.

To his many friends in Atlantic City, George N. Van Sweringen is painting, in eloquent words (we might almost say in moving pictures), the many beautiful things in nature observed on the Pacific coast. Ask him particularly about California.

D. F. Crawford, general superintendent of motive power of the Pennsylvania Lines West, who was compelled to miss the M. C. B. convention, returned Monday in time to act as presiding officer of the M. M. association in President Bentley's absence.

Williard Doud, shop engineer of the Illinois Central, arrived on Sunday morning. An important inspection trip pre-



H. C. Eich, Master Mechanic of the Illinois Central, with Frank Gilmore Telling a Story and M. C. Beymer Looking on.

vented his getting here in time for the M. C. B. meetings. He reports good progress in the work of electrification at the Burnside shops.

The Sherwin-Williams party this year consists of W. B. Albright, director; E. M. Richardson, director; Thomas Madill, manager of the Western railway department; F. M. Elmquist and L. C. Graves. They are quartered at the Marlborough-Blenheim.

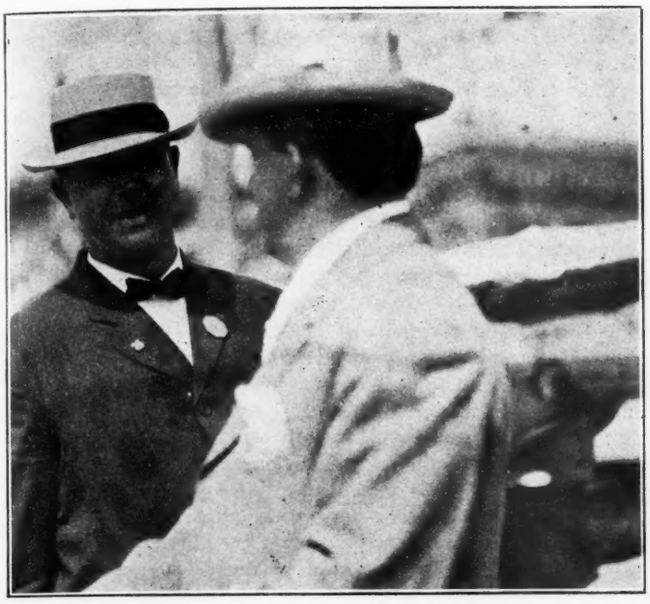
J. F. Pendergast, for 10 years master mechanic of the Baltimore & Ohio at Glenwood, Pa., now master mechanic of the East Broad Top Railroad & Coal Company at Orbisonia, Pa., is taking an active part in the meetings. He is also much interested in the exhibits.

Harry Keller, of the Duntley Pneumatic Tool Company, feels the responsibility suddenly thrust upon him; for on account of important business matters, neither John W. Duntley nor Julius Keller will be able to carry out their plans to attend the conventions this year.

H. S. Demarest, with his family, leaves for Europe about the first of July to be gone until the first of November. They will make an extended tour of several countries. In the

absence of Mr. Demarest, F. E. Ransley and L. J. Van de Wall are here in the interest of Greene, Tweed & Co.

H. B. McFarland, engineer of tests of the Atchison, Topeka & Santa Fe, has a new dynamometer car with a capacity of 1,000,000 pounds, which was put in service a few months ago. He reports that it is proving most valuable for tonnage rating work on the very severe grades in the mountains.



Wells Harris, of the New Haven, Trying to Understand Frank Gilmore's Joke.

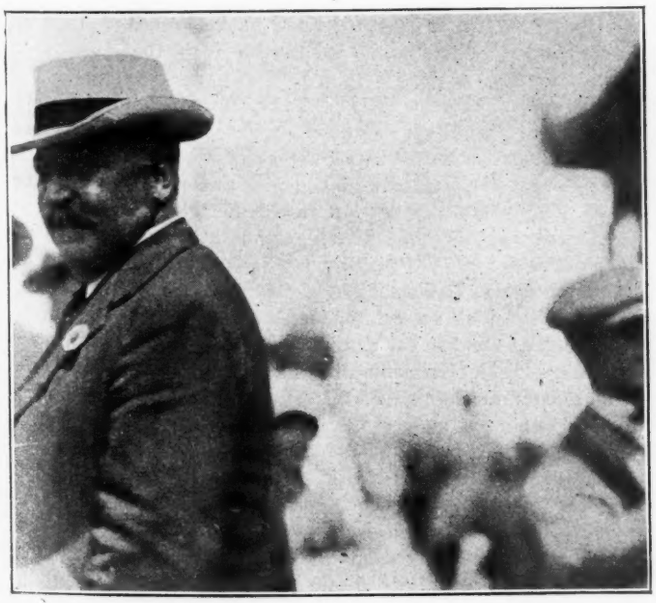
H. F. Wardwell, assistant manager of the Central Locomotive & Car Company, is here for the Master Mechanics' convention and is staying at the Traymore. Last year Mr. Wardwell attended as superintendent of motive power of the Chicago & Western Indiana. Mrs. Wardwell was unable to accompany him here this year.

Secretary Conway disclaims all responsibility for setting up the "Information Bureau" on the beach. We understand, however, that the "bureau" was dispossessed from the pier for non-payment of dues. Early risers yesterday morning sighted a fishing smack just off the pier, in the bow of which the "Information Bureau" was resting easily.

D. E. Fitzgerald, assistant superintendent of motive power of the Frisco, has succeeded in finding time to attend the convention this year. His oldest son, who is attending St. Mary's College at Topeka, Kan., is an enthusiastic baseball fan and asked his father to be sure and send him a copy of *The Daily* containing the account of Saturday's game.

George Carson, District Master Car Builder, New York Central.

Lewis D. Freeman, connected with the mechanical engineer's office on the Baltimore & Ohio, came up from Baltimore for a day or two. *American Engineer* readers will recall him as the author of the article on "Design of Formers for Hydraulic Press" which appeared in the May issue and was one of the very few articles which have ever been published on this subject in any technical paper.



J. D. Murray, from Christmas Island, Indian Ocean. Formerly Mechanical Engineer of the Lackawanna.

J. C. Fritts, Master Car Builder, Delaware, Lackawanna & Western.

W. D. Robb, superintendent of motive power of the Grand Trunk, was ready for the opening session of the M. M. convention early Monday morning. The Grand Trunk is building 75 locomotives. Mr. Robb smilingly observed that although the brick arch had been used in locomotive construction in Canada during the past 35 years we, in this country, had only recently become thoroughly inter-

The Bostonians here at the convention spent most of yesterday celebrating Bunker Hill day. Of all the enthusiasts, Frank Barbey was the superlative degree; but, judging from some of the persons seen walking around with American flags pinned to their clothing, we suspect that Frank decorated some who are not Bostonians. For instance, J. Alexander Brown. Now, Alex. may be built like a bean eater; but why a Bostonian?

C. B. Flint and A. T. Chester, of the recently organized firm of Flint & Chester, arrived in Atlantic City Sunday with Mrs. Flint and Mrs. Chester, having driven down in an automobile. They are stopping at Haddon Hall. Mrs. Flint was formerly for several years with Manning, Maxwell & Moore. Mr. Chester is a graduate of Annapolis and has been in the mechanical department of the United States Navy for several years.

Walter E. Coffin, man-at-large and free lance in general for the National Malleable Castings Company, happened—just happened—to be in America and is attending the convention. Last year he was in South America on his wedding tour. Three years ago he was traveling in Japan. Next year he may be in South Africa. In the meantime, and for the purposes of these meetings, he is near the Greek Temple and keeping his eyes on what is doing around the throne.

D. J. Redding, assistant superintendent of motive power of the Pittsburgh & Lake Erie, reports building 22 heavy switch engines at the McKees Rocks' shops since last October. Plans are being developed for five consolidation locomotives, which will also be built at the company's shops. Mrs. Redding is not attending the convention this year because of the commencement exercises at the State Normal School from which the eldest daughter is about to be graduated.

W. F. Keisel, assistant mechanical engineer of the Pennsylvania, with Mrs. Keisel and their two sons, John and William, Jr., are staying at the Chelsea. They have just come from the commencement at Lehigh University, where Mr. Keisel attended the twenty-fifth reunion of his class and John Keisel attended his first class reunion. The party motored from Altoona to Bethlehem and then to Atlantic City. Miss Virginia Keisel will not be here this year, as she is in Europe taking an automobile tour on the continent.

William Garstang, superintendent of motive power of the Big Four, left for home yesterday. His wife and daughter, Virginia, who are at the Marlborough-Blenheim, will stay until the convention closes. The eldest daughter, Mabel, was married to Felix Robbins at Indianapolis two weeks ago yesterday. They, also, are attending the convention, having arrived last Friday. Mr. and Mrs. Robbins expect to make their home at Mr. Robbins' country place near New Madrid, Mo. Mr. Robbins is a Purdue man.

H. T. Bentley, president of the M. M. Association, is unfortunately confined to his bed in the Marlborough-Blenheim by a severe attack of malaria, which we hope will abate so that he can lend his enthusiastic presence and influence in presiding at some of the meetings before adjournment. Mr. Bentley wished through The Daily to express his appreciation of the many kind expressions of sympathy and offers of assistance that have come to him and his wife and daughter from hundreds of his convention friends.

C. Phillips, master mechanic of the New Orleans & North Eastern, at Meridian, Miss., a regular attendant at the conventions, is stopping at the Brighton with his young son. For a number of years Mr. Phillips has made a practice of bringing one of his children for company after they reach the age of eight or ten years. This is the fourth son; and the fifth one will be about the right age in a couple of years to attend the conventions. Mr. Phillips finds that besides the companionship, the boys themselves derive considerable benefit from these trips.

J. C. Pickard, president of the International Railway General Firemen's Association, arrived on Sunday and will remain through the Master Mechanics' Convention. The General Firemen's Association has been increased by 78 members since the last convention. The reports for the coming convention, which will be held at the Sherman House, Chicago, July 23-26, are all in hand and advance copies are being sent out. Among the more important papers are those on "Shop Organizations," by William G. Reyer and William Hall; "Shop Specialization," by U. T. Gale, and "The Relation of the Testing Department to Shop Efficiency," by J. S. Sheafe.

C. E. Gossett, general master mechanic of the Minneapolis & St. Louis, and father of the assistant mascot for the Western base ball team in Saturday's game, has some interesting stories about the severe weather in Minnesota and Iowa last winter. The weather bureau records show that the temperature at Marshalltown, Ia., was below zero for 26 consecutive days. A passenger train of three cars got caught in a snow storm in Minnesota and was stalled for 49 hours before the rotary snow plow reached it. The temperature was 38 deg. below zero. Fortunately a farm home in the vicinity was able to furnish plenty of food. When the rescue party opened up the way, the engine was able to get its train through to the terminal without assistance.

Daniel Smith, president of the Baker Heater Company, and of the Peter Smith Heater Company; Elmer Smith, secretary and treasurer of the same companies, and H. S. Williams, chief engineer, came by train as far as Buffalo, and motored from there to Atlantic City. They stopped en route for a short time at Elmhurst, N. J., where their families are spending the summer, and Daniel Smith has returned there. The Smith brothers recently have entered the heater business in the steam railway field by the acquisition of control of the Baker Heater Company, and this is their first year at the conventions. Elmer Smith is a base ball enthusiast of renown, and pitched for the winning Western team on Saturday. He is one of the principal backers of the Detroit Tigers, and at times has gone South with them on their spring training trips.

Under the guidance of W. J. Tollerton, mechanical superintendent of the Rock Island Lines, seventeen mechanical officers of that system visited the exhibits on the pier yesterday, going out one side of the pier and returning on the other. The other members of the party were: C. A. Seley, mechanical engineer; J. B. Kilpatrick, district mechanical superintendent; S. W. Mullinix, district mechanical superintendent; C. M. Taylor, district mechanical superintendent; George W. Seidel, superintendent of shops; George Goodwin, assistant mechanical engineer; L. A. Richardson, master mechanic; H. J. Osborne, master mechanic; F. W. Williams, master mechanic; T. W. McCarthy, master mechanic; E. F. Tegtmeyer, master mechanic; W. J. O'Neill, master mechanic; E. J. Harris, master mechanic; R. L. Stewart, master mechanic; C. L. Sharp, general foreman; W. J. Eddy, inspector of tools and machinery; and O. S. Beyer, Jr., traveling inspector. This is the first visit of many of these gentlemen to the conventions and the idea in going through in a party was not only to discuss the merits of the different devices, but also to give those who were visiting the convention for the first time an idea of the importance and value of looking over and studying the exhibits.

The Exhibit.

An interesting demonstration of the methods employed in the manufacture of the Jacobs-Shupert fire box will be carried on during the convention with the assistance of the Oxweld Acetylene Company, who will weld up the seams between the sections.

The "Gold Dollars" that are being given away at the booth of the Gold Car Heating & Lighting Company, New York, are much appreciated by railway men. The little treatise is designed to show how money can be saved by installing the Gold combination pressure and vapor system.

The severe service test to which the Mid-Western Car Supply Company's exhibit car was put on its journey from Chicago has clearly shown that its construction practically eliminates sharp flanges, end journal bearing wear and king pin troubles. It also permits the removal of the wheels without taking the trucks from under the car.

For the first time in America, a flash signal light for railway service is being shown at this convention. This is the mechanism such as is being used in lighthouse service applied to railway signals, and so arranged as to give any desired number of flashes a minute. The Commercial Acetylene Company, New York, has installed in its booth a flashlight operating in a standard Lehigh Valley lamp.

The McConway & Torley Company, of Pittsburgh, Pa., is calling particular attention to the steel castings which it is now manufacturing in addition to their other specialties. Samples of various car castings showing the class of material which it furnishes, are exhibited. These are made of the same high-grade mixture of acid open-hearth steel as is used in making the M. C. B. couplers, the tests of which require a high grade of steel of great uniformity, with high tensile strength. A specialty is being made of car castings such as center plates, push pole pockets, coupler striking brackets, brake connections, pedestals and similar castings.

NEW ARMORED AIR BRAKE HOSE.

An improved armored air brake hose is shown by the Sprague Electric Works, New York, in Booths 379-381. The design has been modified to obtain greater interlocking strength, and at the same time materially increase its flexibility. Features which have previously been criticised have been eliminated. One of the chief objections to the armored hose has been that the fittings and clamps could not be used with the standard M. C. B. hose; but with the Sprague 1⅜ in. air brake hose, no special fittings are required.

The fittings are secured with the standard M. C. B. clamps, but in such a manner that blow-outs are prevented. This is accomplished by means of what is called the armor clamp, which is welded to the armor (instead of being riveted as formerly), and extends under the M. C. B. clamp to engage with the collar on the nipple, or the head of the coupling, as the case may be. Another criticism of armored hose has been with regard to the quality of the rubber used, although it is generally recognized that the use of an armor not only affords protection against external injury and kinking, but by the elimination of stretching of the rubber, deterioration is very greatly reduced. This objection has been overcome by the use of a three-ply M. C. B. hose with the bursting test of the armored hose increased to 1,000 lbs. In order to conform with the M. C. B. badge as nearly as possible, the armor clamp on the coupler end is stamped with the railway's name, size of hose, date of manufacture, and maker's and serial numbers. With this interlocking armor the deterioration due to the sun's rays is prevented, which, in conjunction with the elimination of stretching, abrasion, kinking and blowing out of the fittings, results in long and efficient service. The exhibit also covers a line of armored hose for car heating, and steam and air hose for shop use.

BAKER VALVE GEAR ON OLD POWER.

Most railways have engines that are giving a great deal of trouble with their frames and valve gear. The frame troubles might be materially lessened and possibly removed altogether if the proper frame bracing could be applied; but the Stevenson valve gear prevents these improvements. If an outside valve gear and proper frame bracing could be applied, it is to be admitted the expense and work of keeping these engines in service would be very materially lessened. The machine shops are already overloaded, and these needed changes are put off from time to time.

The Baker valve gear offers an easy solution of the manufacture of the gears, as the Pilliod Company, New York, is in a position to make up these gears and the necessary parts ready to apply. This relieves the railway of practically all the machine work and leaves nothing but the easiest of erecting floor labor.

The roads that are now doing this find that it occasions no delay in the shop and enables the engine to make large mileage, in some cases the mileage being as much as six times what it was before. It does away with the engine coming in for repairs to frames and valve gears and the delays in the roundhouse for valve gear work.

After the gears are applied, the roads also find that the Pilliod Company's guarantee of 5 per cent. efficiency and economy is very conservative, and that the engine is always capable of handling her tonnage, because the gear has the wearing qualities and does not get out of adjustment.

PINTSCH MANTLE LAMPS WITH ELECTRIC IGNITION.

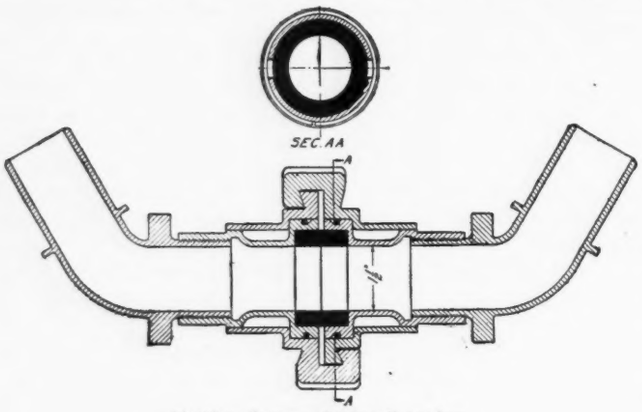
The Safety Car Heating & Lighting Company, New York, has several Pintsch mantle lamps among its exhibits equipped with a system of electric ignition. For some classes of car service, electric lighting fixtures have heretofore been preferable in the matter of convenience to the Pintsch mantle lamp, but with this new improvement and the several new types of fixtures equipped with it, the mantle lamp is placed on the same basis as the electric light from the standpoint of convenience.

All the lamps in the car, or as many as may be desired, can be lighted from one point in the car, doing away with the necessity of the trainman or porter lighting each individual lamp with a torch or matches; in fact, the occupants of the car are unable to distinguish whether electric light or Pintsch mantle light is used except from the increased illumination available with the mantle lamp. The arrangement of this system is simple, an igniting spark being generated by a magneto. The trainman or attendant of the car turns on the gas at the main cock located at a convenient point in the car, preferably the closet, and then turns the magneto handle and the lamps are lighted.

A modification of this arrangement has been designed for sleeping cars, to provide a direct control of the lamp by the occupant of the stateroom or compartment. Each compartment has its individual gas cock on the wall, provided with a combination gas cock and igniter. It is not necessary for the occupant of a stateroom to notify the porter when the mantle light is no longer required, nor is he compelled to ring for the porter when light is required, but the control of the lamp is directly under his personal supervision. No complicated mechanism is required, nor are any elaborate instructions necessary. The Safety Car Heating & Lighting Company has these lamps arranged at its exhibit where they can be demonstrated.

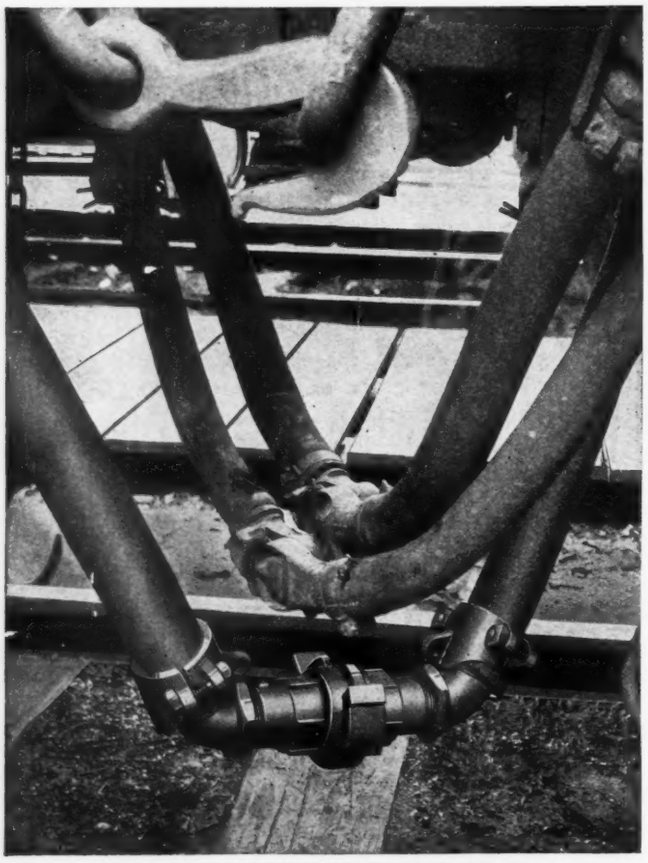
UTILITY STEAM HOSE COUPLER.

One of the chief causes of deterioration and trouble with steam hose couplers using rubber hose is that in bending the hose upward to couple and uncouple, it becomes kinked which reduces the inside area and also weakens the hose, causing it to give out at this point. A greater portion of the steam hose failures are due to this cause. The Utility coupler is designed



Utility Steam Hose Coupler.

to prevent kinking the hose. Each coupler head is surrounded by a loose collar and this collar has a projecting hook lug at one side and a helical flange extending nearly round the remaining portion. To couple two heads together it is only necessary to grasp one in each hand, swing them together face to face, so that the hooked lug of each collar engages the



Application of Utility Steam Hose Coupler.

helical flange of the other. A twist of about a quarter turn forces the couplers firmly together, making a tight joint. A slight tap with a hammer tightens them so they cannot jar loose on the road. To uncouple, a reverse twist loosens them.

In addition to the saving of hose, this steam coupler has other advantages. The gaskets are brought together with their faces parallel so they wear evenly. The helical flanges take up all wear, as it is only necessary to turn the collars until a tight joint is made. No extra locking attachments are needed, as the couplers are always securely locked when coupled. The gaskets must always line up and a full 1½ in. opening is insured. This coupler is made by the Railway Utility Company, Chicago, Ill.

VANADIUM EXHIBIT.

It is getting to be a familiar story, that of the improvement made in the quality of steel by the introduction of vanadium, but it is a familiarity that cannot breed contempt and is still novel enough to make one stop and think and compare it with the ordinary practice of the day. So when we wander into the booth of the American Vanadium Company, of Pittsburgh, Pa., and find what looks and acts like real springs made of cast iron, and all sorts of gimcracks tied into all sorts of impossible knots; and see evidences of limits of elasticity that run from 90,000 to 113,000 lbs. per sq. in., we know that we are in the presence of the unusual. But we have seen tricks played with this steel before, and the real interest lies, in the eating of this metallurgical pudding, in the wear and tear of railway service. So when we see that pair of good conditional tender wheels with 258,529 miles totheir credit; and hear that their

Vanadium Steel Locomotive Frame after Test.

mates have gone 18,000 miles beyond this and are still going, we know that really we are in the presence of the unusual. This means nearly 11,500 miles per 1-16-in. of wear. Then there are some twisted and distorted locomotive frames in the background, of which 3,000 are in service and no failures. The one illustrated herewith was subjected to 15 blows, 17-ft. drop, and one blow, 12½-ft. drop, of a 3,000-lb. ball. The metal in these frames averages an elastic limit of about 49,800 lbs., with an ultimate strength of 79,500 lbs., an elongation of 27 per cent. and a reduction of area of 51 per cent. This is far enough away from the averages of ordinary steel to make one stop and think there must be something in it. Of course, there is! and if you ask George Norris what it is, he will frankly tell you that it's vanadium; and it is but fair to give him the credit of telling the truth.